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Information technologies are transforming the way health care is delivered. Innovations such as computer-based patient records, community health information networks, and telemedicine are beginning to affect the cost, quality, and accessibility of health care. The military health care system has recognized this trend and is on the cutting edge of integrating information technologies, specifically telemedicine, into the delivery of health care.

Taking a lead in this effort is the Lead Agent of the Department of Defense Region VI. The current specialty care delivery process within the four state region requires patients to travel long distances, has specialists repeating testing previously done by remote hospitals, and necessitates multiple trips for patients who require preoperative and postoperative care. One initiative underway to address these problems is the Region VI Telemedicine Pilot Project, potentially the largest telemedicine program in the country.

This management project provides a review of the current regional specialty referral process in terms of cost and access and develops a baseline to be used in the final evaluation of the pilot project. A data collection tool and procedures for the evaluation of the pilot project were also developed. Using documented telemedicine utilization rates, projections of usage were calculated allowing for payback and net present value analyses to be conducted. Based on these calculations, the capital expenditure related to the purchase of the Region VI telemedicine equipment will be recovered at the one year mark resulting in the government saving almost two million dollars annually thereafter.

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GRADUATE PROGRAM IN HEALTH CARE ADMINISTRATION

TRICARE TELEMEDICINE:

"EVALUATION PLAN FOR A PILOT PROJECT"

TRICARE SOUTHWEST

Telemedicine Network - Linking Region VI

GRADUATE MANAGEMENT PROJECT

SUBMITTED TO THE FACULTY OF BAYLOR UNIVERSITY

IN FULFILLMENT

OF REQUIREMENTS FOR

MASTER OF HEALTH ADMINISTRATION

BY

LIEUTENANT DAVE E. GIBSON, MSC, USN, CHE

SAN ANTONIO, TEXAS

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ABSTRACT

Information technologies are transforming the way health care is delivered. Innovations such as computer-based patient records, hospital information systems, computer-based decision support tools, community health information networks, and telemedicine are beginning to affect the cost, quality, and accessibility of health care. The military health care system has recognized this trend and is on the cutting edge of integrating information technologies, specifically telemedicine, into the delivery of health care.

Taking a lead in this effort is the Lead Agent of the Department of Defense Region VI. Region VI covers Oklahoma, Arkansas, and major portions of Louisiana and Texas. The current specialty care delivery process within the region requires patients to travel long distances, has specialists repeating testing previously done by remote hospitals, and necessitates multiple trips for patients who require preoperative and postoperative care. One initiative underway to address these problems is the Region VI Telemedicine Pilot Project, potentially the largest telemedicine program in the country.

This management project provides a review of the current regional specialty referral process in terms of cost and access and develops a baseline to be used in the final evaluation of the pilot project. A data collection tool and procedures for the evaluation of the pilot project were also developed. Using documented telemedicine utilization rates, projections of usage were calculated allowing for payback and net present value analyses to be conducted. Based on these calculations, the capital expenditure related to the purchase of the Region VI telemedicine equipment will be recovered at the one year mark resulting in the government saving almost two million dollars annually thereafter.

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CHAPTER 1

INTRODUCTION

A few years ago the term "Telemedicine" would have drawn a blank stare from all but a select few within this country's medical establishment. Merely four decades old, telemedicine is experiencing a second awakening after a rather unspectacular introduction in the 1950s. Though still relatively a young technology, the term telemedicine and the basic concept are becoming more widely known within the medical industry. The term inevitably will become familiar to more people outside the medical industry as mounting numbers of patients are exposed to this technology when they receive medical care.

Though a more detailed definition and history are provided in the literature review, it is appropriate to give a basic definition of telemedicine at this juncture. Telemedicine is defined as interactive and noninteractive audiovisual communication between health care providers and their patients (Brennan 1996). Through land-based communication networks and satellite technology physicians in remote areas now have the capability to consult directly with specialists in medical centers. A benefit of this delivery methodology is that the specialists can view patients during examination without requiring the patient to travel to the medical center.

Because of the technology's humble beginnings, and its recent reemergence, blanket methodologies for evaluation of projects do not exist. Numerous studies of telemedicine projects have been conducted, but due to how rapidly the technology is changing and the multitude of applications, each evaluation plan to date has been tailor-made for its respective project. The TRICARE Southwest, Department of Defense (DoD) Region VI Telemedicine Pilot Project is no different. The primary purpose of this paper is to document the current specialty referral process within the region in terms of cost and access (create a baseline) and then design a data collection tool and procedures for the evaluation of the Region VI pilot project. Another purpose of this paper is to present the reader with a general understanding of telemedicine, how it began, why it reemerged, examples of both civilian and military telemedicine applications, and hopefully stimulate the reader to contemplate how this technology might improve patient care at their care facility.

Conditions That Prompted the Study

Information technologies are transforming the way health care is delivered. Innovations such as computer-based patient records, hospital information systems, computer-based decision support tools, community health information networks (CHINs), and telemedicine are beginning to affect the cost, quality, and accessibility of health care. Changes in health care delivery systems, including the emergence of managed health care and integrated delivery systems, are breaking down the long-

established organizational barriers between providers, payers, and intermediaries. Emergent health care delivery patterns are supported by, and indeed, reliant on, the widespread use of networked computers and telecommunications (OTA 1995). This phenomenon is not confined to the civilian sector; the public sector, particularly the military, has had to adapt to the changing health care and technological environment.

Trends

Living in a capitalistic society necessitates acceptance of the profit motive. Despite all the moralistic and philosophical posturing that certain industries employ, the desired outcome is the same - profit, return on investment, money. This is not a moral judgement, but it is reality. The medical profession is a noble calling and is placed on a pedestal by our society. An example is the high economic reward and esteem associated with the designation "M.D." Nevertheless, the medical community still needs to pay attention to the bottom-line so they can advance the noble cause. The rising cost of delivering care, as witnessed during the health care reform debate last year, is one of this nation's most pressing problems. Health care expenditures increased from 5.9 percent of gross domestic product in 1965 to 13.9 percent in 1993 (OTA 1995). Total expenditures for health care in 1993 were $884.2 billion. Health care is also a major segment of the economy, employing approximately ten million people (OTA 1995). As the costs of health care have continued to rise, there have been concerns about how to contain and reverse the increase. Due to many of the efforts made in anticipation of national health care reform laws this country actually saw a slowing of the health care growth rate

between 1990 and 1993 (OTA 1995). The medical industry also has to ensure the quality of care meets industry standards and is available to as many people as possible. The health care industry has a formidable task in attempting to balance the three tenets (cost, quality, and access) of health care.

One mechanism to get a handle on the cost, quality, and access that has gained popularity in the last few years is managed care. Managed care refers to a "system of managing and financing health care delivery to ensure that services provided to managed care plan members are necessary, efficiently provided, and appropriately priced" (Frazen 1995). Managed care organizations use many techniques to control access, contain costs, and ensure favorable outcomes for patients. The number of people enrolled in managed care plans has increased dramatically in the past twenty years. By 1992, enrollment had grown to over half of all employees covered by employer group health insurance (OTA 1995).

Besides the growth of managed care, the industry has also seen an increase in large integrated health care delivery systems in the past few years. Dr. Allen Meadors, Ph.D., FACHE, defines an integrated health care delivery system as "A patient-oriented system of care comprising both services and integrating mechanisms that guides and tracks patients over time through a comprehensive array of health, mental health, and social services spanning all levels of intensity of care, with formal arrangements and common financial incentives among all providers" (Meadors and Evashwick 1994). Historically the health care industry has been very fragmented with an unwillingness of the different entities, providers, payers, and intermediaries to share information. Through

vertical and horizontal integration, health care systems are reaping the rewards of being able to offer full "continuum of care" to covered populations (OTA 1995). This trend is also alleviating some of the fragmentation that has been so prevalent in the industry.

Managed care and integrated health care delivery systems are enhancing the value of clinical health data and creating incentives for collecting and disseminating health information electronically within and between organizations. As managed care organizations grow and fee-for-service care wanes, providers have both a financial interest in delivering lowcost care and incentives for documenting and analyzing their care practices. Managed care plans and integrated delivery systems have long sought to reduce transaction costs by computerizing internal communications and automating communications with suppliers and other business partners. Today about 75 percent of hospitals submit claims electronically (OTA 1995). In addition, they have a vested interest in understanding the clinical details of how care is delivered in order to manage resources efficiently (OTA 1995). Health care information systems are now playing a larger role as managed care and integrated health care systems are becoming so dominate in the market. According to a recent survey, 58 percent of health care information professionals plan to increase information investments by more than 30 percent over the next two years (Grace 1995).

Students are taught in high school physics that for every action there is an opposite and equal reaction. This principle can be seen in some of the consequences of the trend toward managed care and integration. More than 800 hospitals have closed since 1980, with approximately 75 percent of those being rural facilities (Nelson and Ritter 1995).

Among the issues rural hospitals have to deal with include lack of access to specialty care, low bed census, patient 'outmigration', and professional isolation (Nelson and Ritter 1995; Jones 1994). As information technology has aided managed care and integration, it is also assisting rural health care deal with its current situation. As managed care plans and integrated delivery systems have focused on developing the administrative uses of information technology, rural hospitals have been experimenting with clinical applications. In particular, telemedicine applications are offering possible solutions to some rural hospital problems.

Benefits from this new technology can be viewed from the perspective of patients, providers and facilities. Patients can expect to see better access to specialty care, reduced transportation and hospital costs, and increased continuity of care from being able to remain in their primary care providers facility (Nelson and Ritter 1995). The main benefits for providers is the reduced feeling of professional isolation and the educational experience of observing specialists treat their patients (Nelson and Ritter 1995). Rural health care facilities benefit from increased revenues through retention of patients and improved ability to recruit and retain qualified providers (Nelson and Ritter 1995).

In the 1970s the dominant technologies were data and text. In the 1980s those were joined by voice, image, graphics, and non-coded information technologies (Hammarstedt 1985). In the mid 1980s organizations were finally starting to realize that if they did not start taking advantage of the growing opportunities provided by information technology they would begin to fall behind in the growing competitiveness of the business world (Packer 1984). Now in the mid 1990s, organizations have become

rather sophisticated in the use of administrative applications of information technology and are looking at the advertized virtues of clinical applications.

Military Health Services System

The Military Health Services System (MHSS) has a unique place among large integrated health care systems. The MHSS consists of two parts: the direct care system of military medical centers, hospitals, and clinics; and the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), a health benefits program that supplements care in the direct care system (O'Neil 1995). The MHSS has to be able to provide comprehensive health care services in peacetime and wartime settings. Employing just under 200,000 military and civilian personnel (with an equal number standing by in the wings as reserves) and operating 127 hospitals, 504 medical clinics, over 300 dental clinics, and countless operational medical units qualifies the MHSS as a large health care system (Lanier and Boone 1993; Baine 1995; Lecholop 1996). The MHSS serves nearly nine million eligible beneficiaries (Lamar 1994). During this student's sixteen year career the medical portion of the DoD budget has grown 65 percent (O'Neil 1995). Including CHAMPUS, total MHSS expenditures were $15.2 billion in fiscal year (FY) 1995 and accounted for 6 percent of the entire DoD budget (Baine 1995). To put this into perspective, the MHSS, in terms of personnel, is larger than the United States Marine Corps.

The rapidly changing social, economic, and political environments have combined to place considerable pressure on the DoD to critically examine the MHSS. Among the

events that have shaped the course the military medical system is now on includes the fall of the iron curtain and the breakup of the USSR. These events resulted in the rewriting of the United States war fighting doctrine that called for an accompanying military draw-down and the offering of the politically correct peace dividend. Since medical manning and infrastructure is driven by active duty strength, it was only a matter of time before MHSS began to feel the pinch. Between FY 1988 and FY 1997 it is estimated that MHSS normal beds will decrease by 41 percent, number of hospitals will decrease by 35 percent and medical centers will decrease by 33 percent (Lecholop 1996). The draw down of medical personnel has not been matched by a draw down in eligible beneficiaries, however, it is projected that between FY 1989 and FY 2001 military medical personnel will decrease by 13 percent and civilian medical personnel will be down 22 percent (Lecholop 1996). This phenomenon has required major revisions to how the MHSS delivers care (Carlton 1996). Coupled with a tightening military budget, the MHSS also had to deal with an external environment dominated by an overall escalation in the costs of health care inputs. The late 1980s also saw dramatic increases in the traditional fee-for-service CHAMPUS expenditures ($1.4 billion in 1985 to $3.6 billion in 1995) which almost consistently overran budget estimates (Baine 1994; Baine 1995; Thompson 1991). In addition to health care industry economic trends, part of the MHSS cost growth was attributed to military beneficiaries' greater use of medical care services than their civilian counterparts (Baine 1995). A Congressional Budget Office study published in 1988 pointed out the serious problem of over consumption by active-duty dependents. The study stated ". . . the average rate of outpatient visits in the civilian

population is about five a year, active-duty dependents average seven outpatient visits a year -- a difference of 40 percent " (CBO 1988).

Besides dealing with fiscal and consumption concerns, military medicine has also had to face other challenges in the last few years. Major concerns about wartime readiness were raised following the experience of providing medical support during the Gulf War. Besides issues relating to manning levels, evacuation capabilities, equipment/supply availability, and specialty mix there was also a serious problem related to the lack of wartime mission training among medical personnel (Baine 1995). Though military medicine is learning to adapt a more business-like perspective to be able to compete head to head with civilian organization, the Gulf War was a harsh reminder of the MHSS primary reason for existence. As a consequence, the MHSS has added emphasis on readiness since the war. Most initiatives must address readiness (or its positive impact to readiness) to have any hope of being approved.

Another challenge facing the MHSS is how to address the constant complaints by beneficiaries regarding access to military treatment facilities (MTFs). Historically, the demand for care in the direct care system has always exceeded the capacity of MTFs, resulting in long delays for appointments and excessive waiting times for outpatient care and specialty care (Baine 1995). In a recent survey, 13 percent of MTF users waited more than one hour in waiting rooms versus the civilian industry average of only 6 percent (Baine 1995). Other concerns that the MHSS faces include; cost sharing and actual health services varying widely by where beneficiaries live, inadequate information systems, and general waste within the system (Baine 1995). Congress' response to these

concerns was to authorize different cost containment demonstration projects, all bordering on the fringes of main stream managed care (Baine 1994). In 1993 the best pieces of these projects were eventually combined into a tri-service initiative named TRICARE (Gibson 1995).

TRICARE, from a conceptual point of view, is rather simple. TRICARE is a health care delivery plan that requires the Army, Navy and Air Force medical systems to pool resources to provide quality health care that is accessible and affordable. TRICARE has four major components: ① twelve health service regions headed by a designated Lead Agent; ② a triple option for beneficiaries (health maintenance organization, preferred provider organization, or indemnity fee-for-service); ③ allocation of resources using a capitation-based methodology; and, ④ at-risk TRICARE support contracts (TSC) with civilian health care companies to complement the MHSS resources (Baine 1994; Carlton 1995). A key provision within the TRICARE concept is that the lead agent is responsible for the establishment of overall policies for the management and referral of patients within each region (Martin 1994).

This giant step into the unknown for the military medical system required a major paradigm shift for most players in the system. One of the interesting things that happens when a major change in direction and philosophy is forced on a large organization is that creativity and innovation become more important (Byham and others 1993). Telemedicine is one of these creative and innovative concepts that has taken hold during the MHSS repositioning.

Description of DoD Region VI

TRICARE Southwest, DoD Region VI covers Oklahoma, Arkansas, and major portions of Louisiana and Texas (see figure 1). Within this four state region there are nineteen military health care facilities supporting nearly one million beneficiaries (Carlton 1995). All three services are represented within the region. The commander of Wilford Hall Medical Center (WHMC), an Air Force facility, has been designated as the Lead Agent for Region VI. In addition to their medical center, the Air Force medical assets in the region include eight hospitals, and five clinics. The Army MTFs include one medical center, three community hospitals, and two PRIMUS clinics. The Navy has one hospital (with three satellite branch clinics). WHMC and Brooke Army Medical Center (BAMC) located in San Antonio provide tertiary care for beneficiaries within the region (Carlton 1995). Many of the MTFs in the region serve small bases in remote and isolated locations. Figure 2 indicates the proportion of beneficiaries by category for the region. Approximately 25 percent of the total eligible beneficiary population (45 percent of those over age 65) live outside the nominal 40 mile radius catchment area of a military hospital (O'Neil 1995). Trend analysis shows this segment of the population is growing and it is anticipated that by

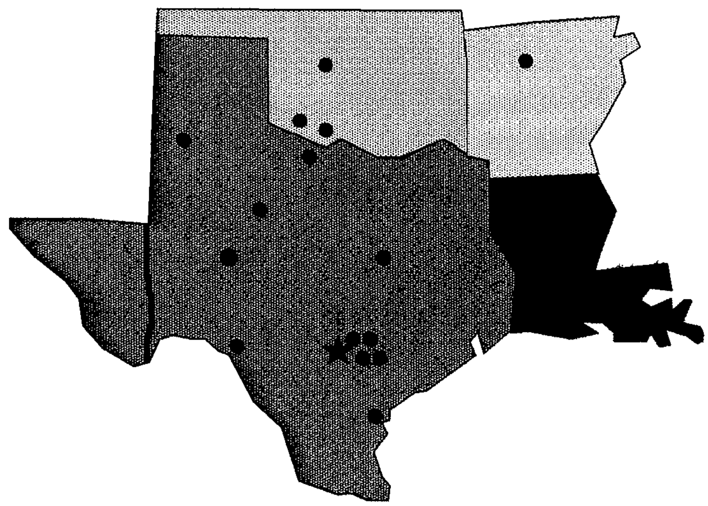

Fig. 1. TRICARE Southwest, DoD Region VI

1999 the overall percentage will jump to 30 (over 50 percent for the over 65 population) (O'Neil 1995). This trend is important because the DoD Telemedicine Test Bed (TTB) management plan directs military telemedicine projects to proactively focus on developing total access for the difficult to serve, the expensive to serve, as well as under served patients who rely on military medicine (Draft Telemedicine Test Bed Management Plan 1994).

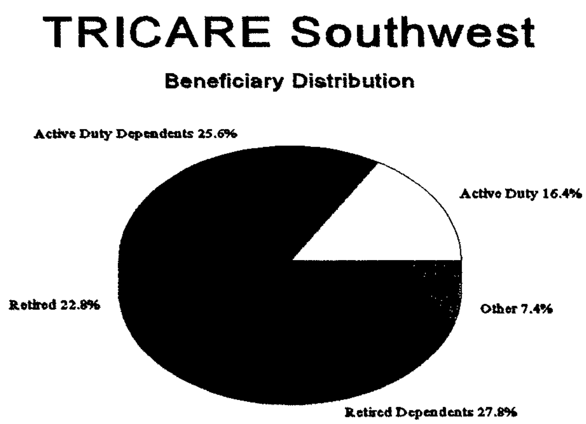

Fig. 2. Beneficiary distribution for TRICARE Southwest, DoD Region VI. *Source:* Regional Health Services Plan, June 1995.

Region VI was fortunate when it had to face the grim realities of the military and medical draw downs. The current Lead Agent for Region VI is a true visionary and is approaching the issue of scarce resources by developing and implementing plans and programs that are on the cutting edge of health care delivery. Current health care delivery within the region requires patients to travel long distances for specialty care, has specialists repeating testing previously done by the remote MTF, necessitates multiple trips for patients who required preoperative and postoperative care, and basic communications between primary care providers and specialists are poor (Carlton 1996). The visionary delivery system championed by General Carlton combines three specific initiatives wrapped up into a concept he terms the Region VI *Virtual Health Care System*.

The Virtual Health Care System is envisioned as a way to:

① Normalize variation in access to care for patients

② Minimize time lost when active duty/family members are referred

③ Maintain or improve medical/surgical skills at smaller and larger facilities

④ Promote effective utilization of resources, serve as a force multiplier

⑤ Enhance readiness posture by functioning in peacetime same as wartime

⑥ Transfer medical information over telecommunication networks

⑦ Provide more economic value with more effective use of existing assets

⑧ Expand medical services globally (Carlton 1996)

A complaint that is often voiced when automation is introduced to medical care is that it will hurt the provider - patient relationship. A recent study of telemedicine conducted by the Congressional Office of Technology Assessment concluded that the provider - patient relationship is in fact enhanced (OTA 1995). This finding was based on the ability of patient, primary care provider, and specialist to "electronically" be together during the specialty examination (OTA 1995). It is felt that full implementation of the Region VI virtual delivery system will have the same positive effects on the region's beneficiaries. The three legs of the virtual health care system are composed of ① The Thursday Hospital, ② Managed Care Outreach, and ③ Telemedicine (discussion to follow).

Many facilities within the region are small hospitals without intensive care units. These small MTFs are faced with decreased complexity in patient mix, decrease need for inpatient care due to small base population, and baseline overhead makes MTF cost per Diagnostic Related Group (DRG) higher than civilian cost per DRG. The result of these

pressures on the small MTFs is that they are currently not cost competitive (Carlton 1996). One methodology that the region is planning to implement as these small MTFs are downsized to clinics is the "Thursday Hospital" concept. The basic concept is not to lock in expensive manpower assets to a small MTF that cannot utilize their talents full-time, but instead transport an inpatient (surgical) team to the MTF once a week (not necessarily Thursdays, could be any day of the week) for a days worth of cases (Carlton 1996). The team would perform ambulatory surgery / procedures on site. Required pre and post operative care would be provided via telemedicine. An inpatient team could be detached from one of the medical centers in the region and travel from facility to facility within the region providing required services (Carlton 1996). Potential savings from 200 procedures at select facilities within the region has been calculated to be $358,034 (Carlton 1996). Though this is a separate and distinct initiative within the virtual health care system, telemedicine still plays a critical role in the success of the concept.

A program currently in place within the region that is akin to the Thursday Hospital is the Managed Care Outreach program. In brief, this program uses C-21 aircraft to transport specialty providers to remote facilities to perform procedures and/or conduct specialty clinics. This allows patients to be seen in their location by military providers with the needed expertise. This is a 24-month demonstration that was designed to equalize access to care across the region. Program averages twelve flights per month. As of January 1996, 84 missions had been conducted and 4,106 patients had been seen at a cost savings of $857,738 (Carlton 1996). Telemedicine also plays an important role in

the functionality of this program by being the means that initial consults and follow-up care is provided.

Region VI Telemedicine Project

The third leg of the Virtual Health Care System is the Telemedicine project. This piece of the system was mandated by the TTB Board (Concept Overview of Telemedicine Operations 1994). The TTB Board gave each Lead Agent / TRICARE Region the following charge:

> TRICARE Lead Agents, with the assistance of their staffs of medical activities within their jurisdiction, will develop plans for management of telemedicine technology at local and regional levels. This local and regional planning process will insure that regional goals are consistent with the TTB Strategic Plan and are consistent with patient needs, resource availability, and medical requirements. Various means of coordination, to include regular teleconferencing, will be used to facilitate communication (Concept Overview of Telemedicine Operations 1994).

With this direction in hand, Captain Ken Bonner, USAF, MSC, Region VI Telemedicine Project Director, began the long process of designing and implementing a comprehensive regional telemedicine program (Bonner 1994). Because the Air Force is the dominate service in Region VI, the task, from a technical point of view, was made easier. The Air Force already had begun an initiative to standardize their communication infrastructure. In a recent White Paper the Air Force published their corporate communications strategy to ensure every base has an information transportation system that will link all existing and planned voice, data, video, graphic, and imagery systems via a fiber optic network (O'Berry 1995). The Air Force vision is to have an information infrastructure that will

support current and future information requirements, including telemedicine applications (O'Berry 1995).

The primary goal of the pilot project is to improve the specialty referral system and change the culture of the practice of medicine in Region VI. The project has five primary objectives calling for improvement in beneficiary access, increasing beneficiary and provider satisfaction, preparing providers for support of deployed forces using this new technology, being cost-effective, and integrating the regional referral process (Bonner 1994). With the goals for telemedicine set, Captain Bonner hit the literature, spoke with leaders in the industry, and visited numerous projects (Bonner 1994). This time was well spent, a multi-phased, multi-pronged plan was developed to implement a wide variety of telemedicine applications to the region (Bonner 1994).

One part of the plan that is technically outside the scope of this paper, but needs to be mentioned is the low-bandwidth video teleconferencing (VTC) network. The importance of the VTC capability to the telemedicine initiative deals more with overcoming "techno-fright" and training than with treating patients. As personnel use the technology, they will become more comfortable with this mode of communication. This network was developed to meet the administrative and educational needs of the lead agent and the nineteen MTFs in the region. System testing has been ongoing for the last few months and will be fully operational March 1, 1996. The TRICARE Southwest Managed Care University is due to open its doors April 1, 1996 that will take full advantage of the VTC network to teach executive skills to health care executives in the region (Lecholop 1995). This initiative is strongly supported in the literature (OTA 1995;

Grigsby and others 1993). According to the proceeding of a recent national conference 75 percent of the on-line time at most telemedicine programs is taken up by educational activities (Allen 1995).

It was determined that the Region VI telemedicine project would utilize an interactive video system integrated with biomedical telemetry. This allows specialists at the medical centers to not only visualize patients at remote locations, but also facilitates immediate feedback from telemetry (Bonner 1994). The system allows integration of a number of diagnostic devices into the video system, such as an electronic stethoscope and an electronic ophthalmoscope (Bonner 1994). The following are a few examples of the systems capabilities. A remote controlled examination camera with a powerful zoom-focus capability allows a dermatologist to examine small details of a patient's skin. Using the electronic stethoscope in conjunction with real-time digital transmission of an EKG and echocardiogram allows a cardiologist to do a complete cardiological examination (Bonner 1994). Specific camera adapters and resolution capabilities enhanced by remote controlled optics provide an ophthalmologist a clear view of the retina of a patient at the referring site. A radiologist can interpret radiologic tests such as MRIs, CAT scans or ultrasounds. A pathologist using the telemicroscopic adapter can even examine a frozen section or bone marrow (Bonner 1994).

It is also envisioned that by allowing a specialist at the medical center to evaluate a patient with the primary care physician (PCP) present (at remote location) the PCP would receive interactive educational input (Bonner 1994). Thus, the educational level of PCP is improved, enabling them to handle more complex problems and effect more

appropriate specialist utilization. This is a concept that complements the primary care management concept of TRICARE. The telemedicine system, by reducing the need to transfer a patient, maintains continuity of care between the patient and the primary care physician. If a patient does need to be transferred, the primary care physician can be updated daily over the telemedicine link. Once the patient is discharged from the referral facility, the specialist's follow-up care of the patient also is facilitated by using the system, without the inconvenience of distant travel by the patient (Bonner 1994).

Dr. Sanders, telemedicine director at the Medical College of Georgia believes that if rural physicians watch urban specialists treating their patients via telemedicine, they might not need to consult with them as often (Scott 1994). This is the same sentiment that the Medical Director of TRICARE Southwest conveyed to this student when he spoke about telemedicine supporting a collaborative learning system (Criddle 1996). Positive findings concerning this issue were documented when Texas Tech University Health Sciences Center HealthNet telemedicine project was reviewed (Grigsby and others 1993). "The volume of telemedicine consultations decreased between 1991-1992, presumably because rural physicians learn enough from many consults that they require fewer referrals to specialists over time" (Grigsby and others 1993).

The long term vision of the Region VI telemedicine project will be to integrate the initiatives of teleradiology, telemammography, teledenistry, tele-education, telepathology, and teleconsultation (both peacetime and contingency support) into one regionally integrated network (Bonner 1994). Of major concern for a venture of this nature is the communication infrastructure. The communication network must be capable

of handling the transmission bandwidth requirements of teleconsulting, teleradiology, telepathology, and video-teleconferencing. The communication protocol must be capable of bandwidth-on-demand technology (ATM). The requirements for bandwidth range from low to high on a continuous basis and sometimes in bursts for some applications (image and data exchange). With full implementation the MTFs in San Antonio will be connected via DS3 technology and with the other MTFs in the region by T-1 lines (Bonner 1994). The network will be designed in a hub and spoke configuration. The ultimate plan is to have this regional network organized to function as a comprehensive system for the whole region (Bonner 1994). It will incorporate new technologies such as ATM, digital compression, store and forward, automated medical record, video E-mail, and computers (Bonner 1994).

The project will be completely implemented by September 1998. The implementation plan has three phases. The first phase will be a pilot teleconsultation project consisting of the two medical centers and five remote sites (see figure 3). This phase will begin July 1, 1996 and run through June 1997 (Bonner 1994). Phase one will enable the TRICARE staff to evaluate the cost effectiveness of the project prior to full regional implementation. Furthermore, phase one will facilitate the evaluation of the administrative procedures and technology

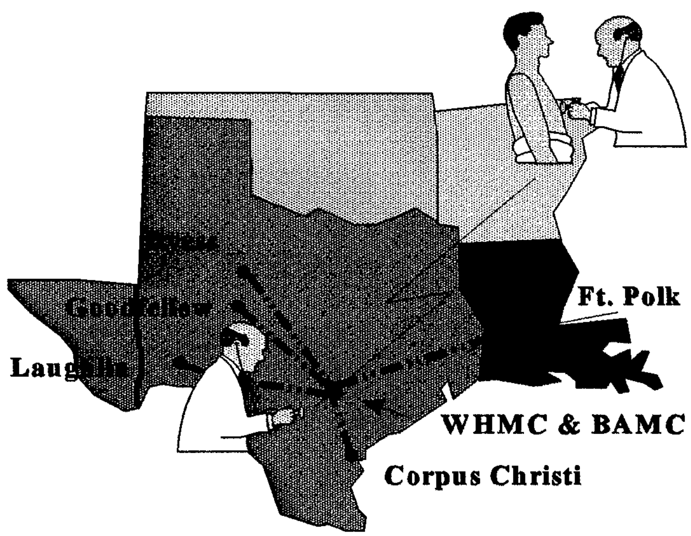

Fig. 3. Phase 1, DoD Region VI Telemedicine Pilot Project

applications. Interactive and noninteractive (store and forward) data transfer will be utilized exclusively for teleconsulting. Phase two and three will run concurrently from January to September 1998. Phase two will apply the lessons learned during the pilot project and bring a few more of the region's remote sights online as well as the northern hubs (Bonner 1994). The third phase will be full implementation of all telemedicine applications (approved for use in the region) and all Region VI MTFs (Bonner 1994).

Administrative, technical and clinical task forces were established to work out the myriad of details associated with implementing the project. Among the issues these task forces dealt with included; site and specialty selection, equipment requirements, evaluation criteria, funding requirements, training, referral policy and procedures, scheduling methodology, and development of a plan of action and milestones (Bonner 1994). It was determined early on that physician buy-in was critical. It was determined that the physicians should have the main voice in which system and capabilities should be procured for the project. Over a two-week period, four telemedicine equipment companies demonstrated their products to a panel of specialists at WHMC and BAMC. Compression Labs, Inc. was selected by the physicians (Lecholop 1996; Bonner 1994). The technical task force chose AT&T to develop the telecommunication network (Lecholop 1996; Bonner 1994).

An initial review of referral patterns was conducted between January and October 1994 to determine which remote sites and what specialities would be included in the pilot telemedicine project. Figure 4 lists the sites and specialities chosen for phase one.

Phase One Sites and Specialities

Medical Treatment Facilities	Specialities
Wilford Hall Medical Center (WHMC), TX (hub)	Dermatology
Brook Army Medical Center (BAMC), TX (hub)	Orthopedics
Corpus Christi Naval Hospital, TX	ENT / Ophthalmology
Bayne-Jones Army Community Hospital, Ft. Polk, LA	OB / GYN
17th Medical Group, Goodfellow, AFB, TX	Cardiology
47th Medical Group, Laughlin, AFB, TX	Neurology
7th Medical Group, Dyess, AFB, TX	Peds Subspecialities

Fig. 4. MTFs and Specialities selected for phase 1, Region VI Telemedicine Project. *Source*: Bonner 1994

Basic demographic, capacity, workload, and staffing information on the seven facilities chosen for phase one can be reviewed in appendix 1 (Carlton 1995). It needs to be noted that if the projected usage in phase one is only 50 percent accomplished, this program will still qualify as the largest in the country in terms of annual referrals (Allen and Allen 1995).

Statement of the Problem

Though the Region VI Telemedicine Project has already been approved and funded, it is the intent of this paper to *review the current specialty referral process in terms of cost and access (create a baseline) and then design a data collection tool and procedures for the evaluation of the pilot project.* This project will concentrate on the

specialities and sites selected for the pilot project as listed in figure 4. Telemedicine as it refers to the Region VI project encapsulates teleradiology, telepathology, distance education, and teleconsulting. It is my intent to concentrate on the teleconsulting piece. It should be noted that by focusing on teleconsulting other pieces of telemedicine (teleradiology and telepathology) were completely intertwined with teleconsulting. While consulting on a case, providers will, in many cases, need to review x-rays and pathology slides, thus these subsets of telemedicine are being utilized in teleconsulting. Since each interaction between presenter and consultant is an educational experience, the educational subset is also being exercised.

Purpose Statement

The purpose of this management project is to determine the cost to the government and access time factors of the current specialty referral process in order to establish a baseline that can be used for comparison against these same factors after the implementation of the Region VI telemedicine pilot project. In order for a comparison to be made it is imperative that appropriate data be collected during the pilot project. The final analysis will not be completed until the completion of the pilot project in January 1997, thus will not be included as part of this management project. The second purpose of this project is to figure out how to determine if the goal and supporting objectives of the project are met, what data is required to make that determination, and how that data is to be collected. The project has five primary objectives calling for improvement in

beneficiary access, increasing beneficiary and provider satisfaction, preparing providers for support of deployed forces using this new technology, being cost-effective, and integrating the regional referral process (Bonner 1994). A more detailed discussion is presented in the methods and procedures chapter where I can present them in conjunction with their related information needs and data collection methodology.

Significance of Project

A study conducted by A.D. Little in 1992, funded by a consortium of telecommunication companies, concluded that telemedicine could reduce national health care costs by more than thirty-six billion a year (Scott 1994). Though this study is referred to whenever funds are being solicited from the government, the study did not take into account the start-up and operation costs of telemedicine systems and equipment (Scott 1994). The aim of the Region VI project is to account for the glaring discrepancies of the Little study so realistic determinations can be made as to the value of this pilot project. While the Little study attempted to make generalizations that could be applied globally that is not the intent of this project. Analysis of the pilot project data will be used to make decisions on expansion of the telemedicine project into later phases. This project will also fulfill a TTB requirement to evaluate MHSS telemedicine projects (Telemedicine Test Bed Management Plan 1994).

Russell Coile, president of the Health Forecasting Group, provided the true impetus for trying to expand the use of telemedicine technology when he stated "Optimum efficiency will come from rapid but sure-footed diagnostic work and delivery

of the most appropriate treatment in the most cost-effective setting" (Coile 1996). These are nice words, but without data and a plan, you will never know if you are there. Most of the articles reviewed talk to "potential" savings, but none actually have real evidence that can be applied globally to telemedicine. Two telemedicine industry leaders readily admit that the promise of telemedicine remains largely intuitive, and though there are some empirical studies ongoing, results are still at least two to three years away (Sanders and Bashshur 1995). At the completion of the pilot, Region VI will have some empirical analysis to guide the future course of their telemedicine project.

Literature Review

Telemedicine Defined

The term 'Telemedicine' can mean different things to different people. It really depends on who you are talking to. The term itself is derived from the Greek "tele" meaning at a distance, and from the Latin "medri" meaning healing (Jones 1993). The key to understanding the concept is to remember that telemedicine is a "tool," and not a treatment, but a medium through which health care can be provided (Criddle 1996; Grigsby and others 1993). The Medical Director of TRICARE Southwest regards telemedicine as a means to transport information not patients (Criddle 1996). A major finding in an evaluation of an Australian telemedicine project conveys this thought very well: ". . . telemedicine is a human activity, not a technological event, and that the technology is merely the vehicle for enabling the delivery of health care services"

(Mitchell and Mitchell 1995). A recent article in *Telemedicine and Telehealth Networks* approaches telemedicine from the opposite direction. The article conveys the obvious by implying that telemedicine encompasses the practice of medicine from a distance. The article goes on to state that telemedicine programs or systems are merely the technology inserted between people communicating (Levens 1995). Dr. Stephen Joseph, Assistant Secretary of Defense for Health Affairs, states that "Telemedicine is the obliteration of time and space by electronic means for the care of patients" (Farr 1995).

Telemedicine embodies concepts such as telementoring, telemonitoring, telepresence, and teleconsultation activities. It also includes collecting, processing, transmitting, storing, and displaying medically relevant data (Draft Telemedicine Test Bed Management Plan 1994).

History of Telemedicine

Initial experiments in telemedicine can be traced back to the 1950s. It is interesting to note that talk about "telemedicine" can be traced all the way back to an article in a 1924 issue of *Radio News* Magazine. The article was titled "The Radio Doctor - Maybe!"(Scott 1994). It should be noted that this article was published two years before the invention of the television. The first wave of telemedicine projects were primarily rural outreach programs funded by federal grants (Allen 1995). The National Aeronautics and Space Administration (NASA) played an important part in the early development of telemedicine (Bashshur and Lovett, 1977). NASA engineers were quick to realize that the technology used to monitor the health needs of astronauts in space

could be used on earth for providing health care to remote sites (Bashshur and Lovett, 1977). Because none of these programs were self-supporting, they all had folded by the late 1970s when the federal grants dried up (Allen 1995).

By the late 1980s telemedicine had found its second wind. Unlike their 1950 ancestors, projects were on a much larger scale with a much wider scope. This phenomena can be attributed to social imperatives of facilitating improvements in access while containing costs (Sanders and Bashshur 1995). In addition to the social imperatives there were three technological developments that spurred a reawakening of interest in telemedicine: ① relatively inexpensive use of fiberoptics for the transmission of communication data; ② coder-decoders that allowed conversion and compression of analog video and audio signals to digital allowing transmission of pictures with good resolution and motion-handling at greatly reduced bandwidths which are more cost effective; and ③ more sophisticated and inexpensive computers that allowed cost-effective data capture, manipulation, and storage (Allen 1995). In 1989 there were three interactive telemedicine programs in North America. By 1993 there were ten such programs and this number doubled one year later to 20 programs in 1994 (Allen 1995).

Telemedicine is a young technology and though it is recently beginning to diffuse at an accelerated rate there are still some obstacles that need to be addressed. Among the barriers to widespread use include lack of reimbursement policies, liability and licensing ambiguities, poor communication infrastructures in many rural areas, and expense of establishing a network (Bergman 1993). These are considered the hot topics in the

telemedicine literature and are being addressed on a variety of fronts. Most of these problems are years away from solutions that can be applied globally.

Telemedicine is often just thought of in terms of the video interactive conferencing, but a recent review of the most popular applications in use indicates that the low cost still-image store and forward systems are becoming the preferred use of this technology (Dakins 1995). Store and forward refers to any system that sends still images or stored video for diagnosis, interpretation, or review in non-real-time.

Civilian Projects

One of the earliest endeavors in telemedicine, the Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC) project, delivered medical care to the Papago Indian Reservation in Arizona. It began in the late 1950s and was sponsored by the National Aeronautics and Space Administration (NASA), Lockheed, and the U.S. Public Health Service. Its goals were to provide health care to astronauts in space and to provide general medical care to the Papago Reservation. A van staffed by two Indian paramedics carried a variety of medical instruments including electrocardiograph and x-ray. The van was linked to the Public Health Service hospital and another hospital with specialists by a two-way microwave telemedicine and audio transmission. (Bashshur 1980). Ten years later the Massachusetts General Hospital (MGH)/Logan International Airport Medical Station was established to provide occupational health services to airport employees and to deliver emergency care and medical attention to travelers. Physicians at MGH provided medical care to patients at the airport using a two-way audiovisual

microwave circuit. The Medical Station was staffed by nurses 24 hours a day, supplemented by in-person physician attendance during four hours of peak passenger use. Evaluation of diagnosis and treatment of the nurse-selected patients was made by participating personnel and independent physician observers. Analysis was also made of the accuracy of microwave transmission. Inspection, auscultation, and interpretation of microscopic images were also performed (Murphy and Bird 1974; Murphy and others 1972).

The University of Kansas Medical Center telemedicine initiative was established in 1988 with an emphasis on teleconsulting. Over the years they have expanded to cover many specialities and some very interesting applications. One such application that caught this student's interest was hypnotherapy (Grigsby and others 1993). The Psychiatry department, especially the child and adolescent psychiatry sections, has used the telemedicine system fairly regularly. One psychologist has even found that he can do regular hypnotherapy sessions with a patient while the patient's regular psychotherapist is present in the room with the patient at the remote site. Both the providers and the patient became comfortable with the video link very quickly and the University is anticipating expanding this type of application (Grigsby and others 1993). Another institution that is showing some very interesting applications of this technology is the Medical College of Georgia (MCG) (Grigsby and others 1993). One of the current shortcomings of telemedicine is that the consultant is unable to palpate the patient during an examination. Instead, the specialist must rely on the presenter at the remote site to provide the information that the sense of touch could otherwise convey. To

address this limitation, MCG is currently collaborating with investigators at Georgia Tech to develop a "data glove" that employs virtual reality interface technology. Using the data glove, the examiner could palpate a mass and the remote consultant, with a sensing device, would be able to discriminate various characteristics of the mass, including texture and compressibility (Grigsby and others 1993). The MCG telemedicine project is one of the more mature programs in the country. Data from the MCG telemedicine project demonstrated that 81 percent of the patients seen over telemedicine have not required transfer to a secondary or tertiary care center which has dramatic implication on cost savings (Sanders 1995).

One interesting segment of our society that is experiencing telemedicine first hand are inmates in our prison systems. Inmates are the only people in our society guaranteed universal access to care under the Bill of Rights (Sanders 1995). Utilization rates among inmates are skyrocketing due to the universal access requirement, an expanding inmate population, and near epidemic rates of AIDS and tuberculosis (Sanders 1995). These trends added to the logistical requirements of transporting inmates to appropriate health care facilities make inmate medicine an expensive proposition. Prisons are usually in rural areas and guards are required on each inmate transport. Between the trends mentioned above, transport costs, and the general risk of having prisoners out of the correctional facilities make telemedicine a very attractive option for prison officials. This assertion has been supported by numerous studies (Sanders 1995).

One prison system that has taken advantage of telemedicine is the Texas Prison System (TPS). Partnering with the University of Texas Medical Branch (UTMB) a pilot

program was conducted in 1994 which was highly successful (Brecht 1995). The TPS is growing at an extraordinary rate. Inmate population grew by 50% in 1995 alone with approximately 150,000 inmates at last count. Referrals to UTMB's specialty clinics increased from 300 per week to 700 per week in 1995 (Brecht 1995). Patient and provider satisfaction data was collected on the more than 700 patient encounters in the pilot project. Perception and comfort with telemedicine were consistently ranked high by over 80 percent of the inmates. Presenters and consultants also gave telemedicine high marks for being an appropriate vehicle for delivering care and as a way to deliver that care. Administrators were also happy that 81 percent of the consults resulted in one or more trips saved (Brecht 1995).

Between 1989 and 1992 another study was conducted by a Texas university (Texas Tech) (Nelson and Ritter 1995). This study looked at patient acceptance. Over 200 patients were interviewed and almost 100 percent preferred a telemedicine consult over traveling to a specialist's office (Nelson and Ritter 1995). Almost 100 percent also had no inhibitions about talking to specialists over the system (Nelson and Ritter 1995). A similar study was conducted in Norway in 1992 and they found 66 percent of the patients were satisfied with the care they received (Nelson and Ritter 1995).

A small hospital in Dodge county Georgia was able to keep 85 percent of the patients once transferred elsewhere thanks to their telemedicine link with specialists at larger facilities (Scott 1994). This is significant due to the cost saving associated with not having to transfer the patients and the cost differential between a small rural hospital and a large urban medical center. Not only are overall costs reduced but the revenues

generated remain within the patient's community (Sanders and Tedesco 1993). Keeping health care dollars within a community is a prime motivator for physicians to remain in the community. This, in turn, strengthens the community hospital's revenue base, enhancing quality of care while reducing patient costs. Since the health care industry is frequently a major employer in rural areas, the entire community can benefit from economic growth (Sanders and Tedesco 1993). The question is begged "What do the large tertiary medical centers get out of it?" This question was answered in a 1994 article in *California Hospital*. The bottom line is that linking with small rural hospitals can be very financially beneficial to the medical center (Stein 1994). The key is in capturing more suitable referrals. Dr. Tom Nessbitt, University of California, Davis Medical Center, stated "Having instant information may save filling one of our beds with a $10,000 admission that could have stayed in the rural hospital, while we'll get, instead, the $60,000 admission that is more matched to the high level of care tertiary centers can offer" (Stein 1994).

Top 10 Clinical Telemedicine Applications in the U.S.

Specialty	Sites Reporting Use
Radiology	29
Dermatology	26
Cardiology	20
Psychiatry/Mental Health	19
Emergency Medicine	17
Pathology	12
OB/GYN	12
Orthopedics	12
Pediatrics	8
Neurology	7
General Internal Medicine	6

* *Based on 72 programs providing clinical telemedicine services in 1995, as reported by TIE.*

Fig. 5. Top 10 Clinical Telemedicine Applications.
Source: Dawkins 1995, page 20

A recent survey conducted by the Telemedicine Information Exchange (TIE)[1] confirmed other industry indicators that teleradiology is the most used application (Dawkins 1995). The top ten clinical applications are listed in figure 5.

Military Health Services System Projects

On 1 September 1994, Assistant Secretary of Defense Stephen C. Joseph, established the Telemedicine Test Bed (TTB) to manage rapidly advancing digital communications technologies with military medical applications. One week later Dr. Joseph proposed that the Army Surgeon General serve as the DoD Executive Agent for telemedicine activities and directed the Army's Assistant Surgeon General for Research and Development to develop a management plan to guide the Telemedicine Test Bed Projects. On 16 December 1994, the DoD Telemedicine Board of Directors approved the TTB Management Plan (Joseph 1994; Concept Overview of Telemedicine Operations 1994). It is the vision of the TTB that MHSS telemedicine projects will provide world class health care to patients and providers, anytime, anywhere (Telemedicine Test Bed Management Plan 1994). The TTB is defined as "The holistic combination of concepts, objectives, organizations, procedures, and physical sites necessary to encourage multi-disciplinary, customer-driven identification of ideas in a way in which systematic testing, evaluation, and deployment occur rapidly. Special focus is given to fostering and coordinating innovation and activity at the user level" (Telemedicine Test Bed

[1] The TIE is an online database supported by the nonprofit Telemedicine Research Center in Portland, OR.

Management Plan 1994). One of the major responsibilities of the TTB is to develop, maintain and operate an interactive telemedicine electronic information service to facilitate information exchange. The TTB has proceeded to develop an outstanding Internet forum where interested personnel can review a wide spectrum of MHSS telemedicine initiatives. The following is a very small sample of the innovative projects currently ongoing within the military medical system.

The Army is on the cutting edge of tactical applications for telemedicine technology. They are currently field testing a system called "Combat Medic Mentoring/Helmet Cam/Dynamic Triage." This system was demonstrated to the Baylor Telecommunications class in 1995 and, in short, is a camera attached to a helmet worn by a medic which sends images back to the field hospital so a physician can direct the medic in the field. This system is being designed for rapid casualty acquisition and early decision support in the "Golden Hour." Battlefield deaths (killed-in-action) could be reduced by 40% and complications of injury vastly decreased with early triage, resuscitation and definitive treatment within the golden hour. The system also allows combat medic mentoring and access to patient data. The concept is to provide early decision support during critical first hour after wounding and high-tech "opportunity training" (Telemedicine Projects Regional Data Call 1996). Another system being developed for the battlefield is the Trauma Care Information Management System (TCIMS). It is an information system designed to enhance the decision-making abilities of combat medical personnel, facilitate information flow, and patient processing in combat and civilian trauma care situations. TCIMS provides critical trauma care

information to ① the battlefield, ② civilian trauma sites, ③ rural / isolated areas, and ④ major disaster sites. TCIMS is also aimed at getting definitive care to patients within the golden hour (Telemedicine Projects Regional Data Call 1996).

The Army is also looking at ways to design a digital medical field hospital. One system that is showing promise is the Medical Diagnostic Imaging Support System (MDIS). This is a filmless radiology system that seeks to use the imaging capability of computer technology to increase information captured from radiographs. MDIS acquires diagnostic images in a digital format, archives and manages the images in a database, rapidly displays images and patient data on clinical and diagnostic level workstations, and communicates the patient demographics and clinical information into a Radiology Information System (RIS) that interfaces to the Composite Health Care System (CHCS) (Telemedicine Projects Regional Data Call 1996). Another project currently on going is the "Remote Telepresence Surgery Project." This project is experimenting with the concept of being able to conduct remote invasive procedures performed with robotics and real-time video links to surgery suites (Telemedicine Projects Regional Data Call 1996).

Naval Hospital, Camp Lejeune, North Carolina in collaboration with four medical schools and five remote area civilian medical treatment facilities is developing a prototype emergency medicine consultation and teleconferencing network. It will establish a mechanism by which high resolution diagnostic images can be transmitted, and full motion interactive teleconferencing can be shared over the State of North Carolina's ATM/Sonet Information Highway. This project will expand the current consultative capabilities of the involved medical centers to real-time video consultations.

The network will allow the instantaneous exchange of x-rays, CAT scans, MRIs, and other radiological images with high resolution (Telemedicine Projects Regional Data Call 1996). The Navy is also deploying telemedicine outside the United States. It is the intent of the European telemedicine initiative to provide services such as diagnostic teleradiology, store-and-forward still images and full motion video, and video teleconferencing/teleconsulting in order to provide the best health services available to remote/isolated facilities in the Navy's European theater. The objective is to minimize patient movement, maximize turnaround time in diagnosing images from five days to several hours, reduce cost in back filling radiologists and other specialists at these remote locations, provide specialized care to remote sites, and increase efficiency and effectiveness of medical staff in treatment of patients (Telemedicine Projects Regional Data Call 1996).

An exciting on going project at Walter Reed Army Medical Center is known as Project ProMED. This is an evaluation of the capability to use a wireless hand held computer device to increase the efficiency of access to results reporting and interactive data/order entry for physicians and other health care providers anywhere in a hospital. An interface to legacy-based information databases allows access to patient charts, retrieving laboratory and radiological reports, ordering lab tests and medications directly from the hand held computer notepad. Increased access will make information available to the health care provider on demand and facilitate the provider in updating patient record information (Telemedicine Projects Regional Data Call 1996). A joint military / civilian ophthalmology study was conducted in 1994 in Colorado. Twenty-nine patients

from Fitzsimons Army Medical Center's Department of Ophthalmology received retinal examination in Boulder, Colorado. The examinations were performed using video funduscopy, intravenous fluorescein angiography, B-scan ulrasonography, and 3-D stereo imaging. The resulting imagery was compressed and transmitted by a two-way video conferencing system via satellite to Johnson Space Center (JSC) in Houston, Texas. At JSC, a medical team was assembled to provide expert consultation. Each consultant in Houston developed an individual diagnosis prior to discussions and determination of a consensus diagnosis of each patient's condition. These diagnoses were compared to the patient's medical record. Agreement was measured between the medical record and the individual consultant diagnosis, and the consensus. The resulting values were 74.6 percent and 94.4 percent respectively. The results supported the use of telemedicine for select ophthalmology patients in isolated locations (Caputo 1994).

Cost, Access, and Quality

According to all the literature reviewed in the course of this project (including the two major reports by the Office of Technology Assessment {OTA} and the Center for Health Policy Research which included a cross-section of the telemedicine projects around the country and some foreign projects) no blanket endorsement of telemedicine's effectiveness can be made at this point by anyone. It has also been repeatedly echoed that it is too soon to know whether the use of telecommunications to deliver health care services will actually lower costs (OTA 1995). This sentiment was a caveat in most cases by stating that telemedicine would seem to have the **potential** to lower costs for some

participants. For example, telemedicine can eliminate time and wages lost at work and traveling expenses incurred when specialists and/or patients have to travel for consultations (OTA 1995). The cost of a bed in a community hospital is also considerably less than in a large medical center. Costs might also be reduced by staffing hospitals and clinics with a higher ratio of allied health professionals to physicians (Grigsby and others 1993). Overall costs also could be lower using telemedicine if it allows patients to be seen earlier, thus preventing the need for later, more costly care (OTA 1995).

On the negative side, telemedicine in the short term could cost more than traditional care. The main factor is that costs could increase as startup costs are figured into the equation (OTA 1995). Since telemedicine has the potential to improve access, there may also be a corresponding increase in the use of health services (OTA 1995). It was the conclusion of a major Center for Health Policy Research study that ". . . a full understanding of the costs and benefits of telemedicine will be difficult to accomplish until telemedicine has been relatively well integrated into the ordinary system of delivery of medical care and systematically evaluated from a health services research perspective. This could take several years" (Grigsby and others 1993).

Numerous projects have shown that in remote rural areas, or inner city areas, telemedicine has the **capacity** to increase access to medical care (Grigsby and others 1993; OTA 1995). It can do so by making these areas more attractive to health care providers by giving them immediate electronic access to up-to-date information and

resources (OTA 1995). Providers in these areas also have greater access to specialists for consultative purposes and continuing medical education. (OTA 1995).

Satisfaction with telemedicine is on the other hand very well documented. The literature supports the view that patients, presenters, and consultants are very satisfied with what they have seen in the way of telemedicine. With the technology changing every day, it is anticipated that telemedicine will firmly ingrain itself into the practice of medicine. Not only will telemedicine become a major tool in the delivery of health care but it has the potential to actually change it. A quotation from an article by Rhonda Bergman draws an appropriate analogy “I think it [telemedicine] is going to have the same impact on medicine as the fax machine had on the post office” (Bergman 1993).

In the Region VI pilot project, it is anticipated that access to specialty care will improve, total costs will decrease (in the long run), and that providers and patients will be satisfied with telemedicine as a tool. Access, cost and satisfaction are elements of health care that are readily accessible for evaluation. Quality on the other hand is a little tougher to get your arms around. It is an assumption of this project that quality will, at minimum, remain the same. Telemedicine appears to have the potential to improve the quality of care, but this has not yet been proven (Grigsby and others 1993; OTA 1995). The OTA study determined that telemedicine can provide faster, more convenient treatment and minimize the disruption of the patient's life (OTA 1995). The quality of care **may** be better for a patient who has the benefit of family support in the local area. For providers, ready access to information to help them make more informed decisions will improve the quality of the care they deliver (OTA 1995).

CHAPTER 2

METHOD AND PROCEDURES

This chapter discusses the methods and procedures that were used for reviewing the current specialty referral process and the development of a data collection tool and procedures for the evaluation of the telemedicine pilot program. This chapter will also specify the methodology employed in this management project as well as assumptions and limitations. Following a discussion on the data collection tool is a general breakdown of the approach used in data collection and evaluation of the pilot program objectives.

A quantitative and analytical methodology was used in the development of a specialty referral baseline, data collection tool, and data collection procedures. The object of interest in this management project is the actual specialty encounter, be it in person at the specialist's office or at a remote MTF via telemedicine. Regarding development of the baseline, the primary instrument in data collection was a retrospective review of the seven selected referral specialities from the selected five remote MTFs to the San Antonio Service Area (SASA) during FY 1995. Data was captured using a variety of methods, including interviews, MTF reports, the Medical Expense Reporting System (MEPRS), the Retrospective Case Mix Analysis System (RCMAS), the Medical

Analysis Support System (MASS), the Composite Health Care System (CHCS), existing TRICARE databases, and Foundation Health Federal Services (FHFS) reports. The data and procedures developed in this management project will facilitate completion of a full evaluation at the end of the pilot project in June 1997. The evaluation will use a basic comparison model to determine how the introduction of telemedicine impacted cost to the government of specialty referrals and how the project impacted access. It was imperative that the eventual goals of the evaluation plan be considered so that the tool designed would answer the appropriate questions. The methodology employed in approaching this management project consisted of the following steps:

- Conduct basic literature review on tenets of telemedicine
- Review primary goal and supporting objectives of the telemedicine pilot project
- Review literature / class material and select an appropriate model for final project evaluation
- Review literature and current outreach programs for data collection tools
- Evaluate each objective to determine the best way to measure the degree of accomplishment for the objective
- Determine information requirements from both a retrospective and prospective data capture perspective for each objective
- Determine location of baseline data and methodology for data collection
- Design data collection tool and procedures for prospective data collection
- Conduct a baseline review and implement data collection plan

Assumptions and Limitations

For the purpose of this management project, it was assumed that:

① Data collected through MTF interviews and derived from government computer systems are accurate

② The quality and outcome of an office visit vs. that of a telemedicine encounter are the same

③ Once the data collection tool and procedures are deployed, they will be used as designed by participants

④ FY 1995 was a representative year in terms of specialty referrals

⑤ Encounter times will remain the same and the Medical Centers have enough excess capacity to absorb recaptured direct care and CHAMPUS referrals

⑥ Only DoD providers order specialty referrals from the five remote sites and only board certified DoD specialists in SASA receive said referrals

⑦ Referring physicians at remote MTFs will complete established specialty workup protocols prior to specialty encounter, i.e., labs, studies, x-rays, etc.

The project was limited by the following:

① Having to utilize available archival data to develop a baseline versus being able to design a data collection tool and collect data prior to implementation of the pilot project

② Inability of telemedicine software to download data to other computer systems requiring the manual duplication of many data elements by participants to a data collection form

③ Data insufficiency - an inability to collect data relating to the following cost elements; dependent lost wages, convenience, child care, etc., necessitated focusing on 'cost to government' as opposed to total cost

Data Collection Tool

The data collection tool was developed concurrently with the data collection plan. Review of the literature revealed that actual program results were always project specific and relatively sparse considering the amount that is being written on telemedicine. None of the reviewed telemedicine projects in the literature provided specifics on evaluation plans. A few evaluation plans were eventually acquired through an informal network of telemedicine program directors.

Review of material from the Mid-Nebraska Telemedicine Network, the Eastern Montana Telemedicine Project, the UTMB Project, the Region VI C-21 Program (Managed Care Outreach Program), and a monograph on telemedicine evaluation by Dr. Itzhak Jacoby, Ph.D. provided more than enough information for the design of a data collection tool for the pilot program (Benson 1995; Jones 1993; Brecht 1994; Blessing 1995; Jacoby 1995). Two primary goals were established for the data collection tool; ① that it answer the questions, i.e., that it do the job for which it was designed, and ② that it be as simple and user friendly as possible. Goal two is predicated on the theory that administrative burdens placed on clinical personnel should be as 'low labor intensive' as humanly possible to meet the requirement.

With the exception of the C-21 tool, no evaluation tool reviewed was less than four pages in length (Benson 1995; Jones 1993; Brecht 1994; Blessing 1995; Jacoby 1995). The C-21 data collection tool is a one page scanable bubble sheet (Blessing 1995). Most of the tools consisted of multi-page pre and post questionnaires of

presenters, consultants, and patients. Looking closer at the programs for which the tools were designed revealed that network configuration, program objectives, and participants dictated methodology for data collection (Benson 1995; Jones 1993; Brecht 1994; Blessing 1995; Jacoby 1995). There was no universal evaluation tool that could simply be applied to the Region VI pilot project and be effective.

It was determined that the C-21 data collection tool provided the best starting place for designing the telemedicine tool. The generic advantages of the C-21 tool were that it was very simple for users to fill out, it used scanable data collection technology which is less labor intensive and more accurate than other tools reviewed, some data fields could be easily adapted for use in the telemedicine program, and the MTFs were already familiar with using Scantron forms. However, one major logistic question had to be answered before making the decision to go with a scanable form. When the C-21 form was filled out it was done by one person in one location. The telemedicine tool would require information to be gathered at two separate locations and then the data would need to be brought together to represent one patient encounter. Discussions with the TRICARE information systems personnel determined that it was feasible, as long as the form and the procedures were designed to accommodate the merging of patient encounter data. With the goal of keeping the form as simple as possible in mind, it was decided to push for a generic form that could be used at both remote sites and the medical centers. Two fields were identified (family member prefix/sponsor social security number and date services performed at remote site) as the key fields for merging the data in a relational data base which would be maintained in the TRICARE office.

With the technical problem of data merging resolved, the actual design process began in conjunction with formation of the data collection plan based on the program's objectives. As information needs were identified, fields were developed to collect the required data. It became obvious early on that most data fields on the form would need to be duplicated to accommodate both the remote site and the medical centers. Upon completion, the form was two pages long (one page front and back) and completely met the two primary goals established for the tool. Basic formatting and demographic fields were reproduced from the C-21 tool. The satisfaction questionnaire portion of the form consists of questions modified from the UTMB program (Brecht 1994). The actual satisfaction evaluation plan for the UTMB program was designed by Dr. Robert Brecht, Director of the UTMB program, who is under contract as a consultant on the Region VI project (Bonner 1996). The approved data collection form is included as appendix 2.

The software being utilized for teleconsulting is very advanced. The software provides the capability of inputting and transmitting live action video, still images, and audio in a touch screen computer environment. The environment also supports a wide spectrum of word processing and data base management capabilities. This software allows the integration of consultative protocol templates. These templates once designed by the specialists will simplify the consultative process significantly. Specialists will establish what information they need to make a determination on a case and these fields will be included in a template. When physicians at remote sites have, for example, a dermatology case, they would bring up the system to schedule the telemedicine consult and the dermatology template would come up and identify to the remote site physician

what information (labs, studies, or imagery) the specialist requires. Initially it was my intention to design the data collection tool that would overlay each of these protocol templates. This concept for data collection is the ideal, but for the purposes of the pilot program it was impractical. The main reason is that there is currently no easy way to transfer the data to a system that can perform the required analysis. The telemedicine computer system and software are stand alone, and it will require software engineers to modify the software to allow data transfer. This effort has been requested and it is envisioned that in the future data collection will become practically automatic each time a telemedicine consult is accomplished. The data will be maintained in a protocol database in the TRICARE office.

Goal and Objectives

The primary goal of the pilot telemedicine project is to improve the specialty referral system (ensuring at least cost neutrality, improve or at least not change quality and improve access) and change the culture of the practice of medicine in Region VI. This goal is supported by five primary objectives: ① improve beneficiary access to referrals; ② increase beneficiary and provider satisfaction; ③ prepare providers for support of deployed forces via teleconsulting; ④ be cost-effective, or at least cost neutral; and, ⑤ integrate the regional MTF referral process and facilitate cross service referrals (Bonner 1994).

The same basic methodology was employed for each objective in the development of the project data collection plan. The complete Region VI Telemedicine Project Data Collection Plan with information needs, data locations, and data collection methodology can be found in appendix 3. Objective one is presented below to illustrate the approach followed in the development of the data collection plan.

Objective One

Objective one is to improve beneficiary access to referrals through the use of telemedicine. The two questions that will need to be answered at completion of the pilot program to measure objective accomplishment are "What was beneficiary access to referrals before the introduction of telemedicine?", and "What is beneficiary access to referrals with the introduction of telemedicine?" The first step was to identify what information was needed to answer the question. Historical referral patterns (number, sites, and specialities), non-availability statements (NAS)[2] issued from remote sites for services available at WHMC or BAMC (limited to the high use specialities identified in the historical review), average time between referral and specialty appointment, and number of specialty referrals accomplished through telemedicine plus traditional referrals as compared to a historical baseline would provide an analyst enough information to answer the questions.

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[2] Non-availability statements are forms given to patients when they require services that can not be provided by a MTF.

The next step in the data collection plan development was to determine where the data was collected and maintained and how to access the data. Keeping in mind that both retrospective and prospective data was needed in order to do a comparison at the end of the evaluation period, each information need was approached differently. Retrospective collection was primarily accomplished through review of data in government computer databases, facility reports, and interviews. The prospective data involved inspection of the draft data collection tool to see if one of the already established fields would capture the required data. If there was not a field on the form that would capture the data then one was designed and added.

The historical referral pattern data was confined to the specialities and sites previously selected in the original referral pattern study. The number of specialty referrals was compiled from FY 1995 data in RCMAS (inpatient), MASS (outpatient) and facility reports. Information on NASs issued was requested directly from the remote MTFs for FY 1995. To determine the current average waiting time for a consultant appointment required interviewing personnel at the remote MTFs. Three data fields for the collection tool (date services performed at remote site, date consult scheduled by remote site, and date services performed at medical center) were developed to capture this information prospectively. Total number of telemedicine data collection forms processed plus RCMAS and MASS data (telemedicine will not take care of all referrals) during the pilot period will provide the number of referrals after the introduction of telemedicine. Improvements in access will be indicated by more total referrals being conducted and a

decrease in the time it takes for a patient to be evaluated by a specialist as measured from the time a primary care physician requests a consult.

Objectives Two and Three

The same basic process (identify the questions that need to be answered, figure out the data required to answer the question, and the location and/or method to get the data) was followed for the remaining four objectives. Objective two deals with telemedicine satisfaction issues. Since there is no historical data within the region concerning this issue only prospective data will be complied. The pilot project will provide the baseline for further evaluation. Positive accomplishment of this objective will be gaged initially against benchmarks in the literature. Objective three is concerned with preparing providers to use telemedicine in deployed situations. Again, there is no existing data on this issue within the region so no historical comparison can be accomplished. The data collection tool will be able to identify specific providers who have used telemedicine within the region and the satisfaction data will be able to gage provider comfort levels with the technology. With this information it will be possible to generate a list of providers who have differing levels of exposure to telemedicine which could be relevant in future deployment scenarios.

Objective Four

Objective four deals with the cost aspect of the pilot program. The goal of this section was to gather the information necessary to calculate an average cost to the

government per consult by site and specialty both with and without telemedicine for active duty and non-active duty patients. Utilizing available FY 1994 MEPRS data, physician specialty pay information, travel costs, and lost duty day information, the baseline per consult cost to the government for active duty patients was calculated:

WHMC / BAMC average marginal cost of each selected specialty
+
Cost of specialist's time
+
Travel expense from remote MTF
+
Cost of associated lost duty days

The same calculation, minus travel expense and cost of lost duty days, was used to derive the baseline per consult cost to the government for non-active duty patients. Taking the per consult rate times the number of consults performed produced the FY 1995 cost to the government for specialty referrals by specialty and remote site.

Marginal cost is defined as the Operating and Maintenance (O&M) supply cost to do one more unit of work, which in this case, is the O&M supply cost to see one more patient. O&M supply costs represent costs that vary with workload. Personnel, overhead, support, etc. are considered fixed and are not computed in the MEPRS's DoD standard element of expense code (SEEC) for O&M supply. This figure was derived by using FY 1994 MEPRS workload and cost data for WHMC and BAMC. MEPRS codes by specialty were used to establish workload (total inpatient and outpatient), then contributing costs (pharmacy, laboratory, blood bank, central supply, etc.) were added to

the direct and prestepdown purified (shared) costs. The cost figure was then divided by the workload to get the marginal cost. The marginal cost by specialty for WHMC and BAMC were averaged to get an average marginal cost for SASA for each specialty.

Standard MEPRS's officer pay figure plus calculated physician special pay divided by twelve months and duty hours in a month equaled the average hourly wage by specialty for military physicians. This hourly wage times the average specialty appointment time give us the cost of the provider's time. Travel expense was calculated for each specialty and remote location. The calculation was based on the average number of days it takes for a specialty consult to be accomplished and the cost of transporting the patient to the SASA. Using the time calculation above times the MEPRS average active duty member's salary cost provided the average cost of a lost duty day.

The formula to calculate the average cost to the government per consult by site and specialty using telemedicine for active duty and non-active duty patients is:

Cost of Provider's time (attending physician and specialist)
+
Allocation of telemedicine expense (equipment and training)
+
Allocation of recurrent communication costs

Marginal costs, as derived through MEPRS, are no longer being incurred at the SASA medical center and have already been incurred at the remote site prior to the specialty encounter. Remembering that the object of interest is the actual specialty encounter and the assumption that the referring physician has already performed all the established

specialty workup protocols prior to specialty encounter removes the O&M supply cost from the equation. Even though supplies are not being expended at the SASA medical center, the specialists are still investing time in using telemedicine to evaluate the patient. By using telemedicine, attending physician time at the remote site must be accounted for in the cost to the government for the consultation. Telemedicine brings the attending physician into the actual consultation. Telemedicine equipment, communication (sunk), and training costs associated with establishing the telemedicine pilot project were allocated to each consult based on projected usage of the telemedicine system during the pilot year. The decision to allocate the entire capital investment in the first year will become obvious after review of the payback calculations in the results chapter. The recurrent communication costs were also allocated on a projected per telemedicine referral basis. An estimated cost per consult by specialty using telemedicine was calculated using estimated workload during the pilot period.

Estimate of telemedicine usage also came in to play when it came to calculating an estimated cost to the government for telemedicine during the pilot period and savings realized with telemedicine. Dr. Sanders from the MCG telemedicine project demonstrated that 81 percent of the patients seen over telemedicine did not required transfer to a secondary or tertiary care center (Sanders 1995). Using FY 1995 baseline data and Dr Sanders documented referral savings, telemedicine workload for the pilot project was calculated as FY 1995 referral rate times .81. If 81 percent of the referrals could be accomplished via telemedicine then logic dictates that 19 percent of the baseline would require traditional referrals to specialty care. When projecting total cost to the

government for specialty referrals with the introduction of telemedicine the referrals that are conducted in the traditional manner must be figured into the equation. These projections were calculated so equipment and communication cost allocations could be accomplished. The assumptions made in this project concerning encounter times and medical center excess capacity could impact the usage projections. It was assumed that encounter times will remain the same and the medical centers have enough excess capacity to absorb recaptured direct care and CHAMPUS referrals. The literature indicates that the average telemedicine consult for the specialties under consideration is twenty minutes for interactive and five to ten minutes for noninteractive (Allen 1995; Allen and Allen 1995; Bonner 1996). This indicates more telemedicine consults could be accomplished in the same amount of time. The ability to see more consults in the same amount time has the potential to ease capacity concerns at the medical centers. Figures required to calculate estimates of these factors can, at best, only be guessed. Thus, at this juncture it was determined that it was impractical to make estimates as to percent of usage by mode and facility capacity. Real time data concerning these issues will be collected during the pilot year, thus for the purpose of usage projection it was determined that these factors would off-set. These issues are discussed because further investigation may be required at the pilot evaluation should referral projections be significantly different from actual referrals performed. More accurate cost and access figures will be derived at the completion of the pilot project when actual workload data can be applied to the equation.

A straight comparison of the cost of a specialty consult with and without telemedicine fails to recognize the potential savings in direct care and CHAMPUS. Each of the remote MTFs not only referred patients to the SASA, but also referred patients to local physicians and hospitals. Potentially 81 percent of these referrals could be recaptured using telemedicine leaving only 19 percent that would require referral to the local economy. The cost of these referrals are reflected in direct care (active duty) and CHAMPUS expenditures of the remote MTFs. Information concerning direct care and CHAMPUS expenditure by specialty referral was collected from each remote site allowing for calculation of total cost to the government for direct care and CHAMPUS. Applying projected workload with telemedicine, direct care and CHAMPUS savings were calculated.

Initial justification for the telemedicine capital expenditure was based on a rough payback analysis (Bonner 1994). To stay consistent with the methodology of the initial proposal a payback analysis using collected baseline and projected utilization data was conducted. In order to account for inflation and alterative uses of capital a net present value (NPV) analysis was also conducted (Cleverley 1992). To meet the TRICARE intent of the pilot, calculations accounting for notional dollars associated with depreciation were removed from the final calculations so only actual dollar expenses and savings were reflected (Bonner 1996). Positive accomplishment of this objective will be achieved when cost avoidance surpasses the capital expenditure for equipment / support and the annual communication costs.

Objective Five

Objective five is concerned with facilitating cross service referrals. Historical referral data, broken down by MTF affiliation, will be compared to prospective referral data to gage the number of referrals between the different services. Positive accomplishment of this objective is achieved by easing the referral process within the region. Appendix 3 is a further breakdown of the data collection plan. The key however is that the data collection plan will readily identify if the Region VI Telemedicine Pilot Project objectives were met. Field data collection procedures (appendix 4) and data form block definitions (appendix 5) were also developed in the course of this project and are to be included in the Regional Telemedicine Users Guide.

Pilot Evaluation

Once the FY 1995 access and cost data is collected it will be used as a base from which actual data, collected via the telemedicine data collection tool, will be compared. Completed bubble sheets will be mailed to the TRICARE Southwest office monthly by the remote MTFs and the participating specialty clinics at WHMC and BAMC. These bubble sheets will be scanned directly into the TRICARE computer database established for this program. The TRICARE information systems personnel have developed a sophisticated computer routine to capture and quality check the data from the scanable forms. Forms rejected by the computer (i.e., incomplete information, eighty year old active duty personnel, etc.) will be researched and corrected. The captured data will be

available for query and comparison as needed. Pilot evaluation will consist of comparing the baseline data against the data collected during the pilot period. The actual data will also validate or invalidate the projections calculated in the course of this management project.

CHAPTER 3

RESULTS AND CONCLUSIONS

This chapter presents FY 1995 baseline access and cost data along with payback and net present value analyses based on projections of telemedicine usage. The breakdown of FY 1995 access data presented in figure 6 indicates that 7,661 specialty

Baseline Access Indicators - FY 1995

		Number of Specialty Referrals to SASA			Number of Specialty Referrals to Civilian Facilities				Average # of Days Btwn Referral & Pt Seeing Specialist
Remote Site	Specialty	Active Duty	CHAMPUS Eligible	Over 65	Active Duty	CHAMPUS Eligible	Over 65	Number of NASs Issued	
Corpus Christi	Dermatology	54	85	84	2	63	0	6	49
	Orthopedics	14	11	43	1	49	0	23	54
	ENT/Ophth	32	41	67	8	120	0	16	51
	OB/GYN	5	11	2	56	175	0	660	32
	Cardiology	23	12	102	10	140	0	70	48
	Neurology	56	60	56	4	40	0	30	59
	Peds Subspecialities	0	55	0	0	154	0	151	47
Ft. Polk	Dermatology	2	0	0	0	0	0	0	18
	Orthopedics	130	29	5	0	0	0	10	90
	ENT/Ophth	80	20	0	40	20	7	18	14
	OB/GYN	44	0	0	8	20	0	67	14
	Cardiology	64	24	40	20	77	180	28	21
	Neurology	100	80	0	100	120	35	7	14
	Peds Subspecialities	0	280	0	0	3	0	22	21
Goodfellow	Dermatology	58	5	1	20	20	3	0	45
	Orthopedics	460	16	2	352	45	16	0	45
	ENT/Ophth	190	12	3	165	69	26	0	45
	OB/GYN	110	2	2	190	15	0	0	45
	Cardiology	88	3	4	64	9	14	0	45
	Neurology	84	7	1	78	15	3	0	45
	Peds Subspecialities	0	20	0	0	13	0	0	45
Laughlin	Dermatology	10	12	20	0	0	0	0	45
	Orthopedics	15	30	47	0	2	0	2	45
	ENT/Ophth	2	5	15	0	0	0	0	45
	OB/GYN	3	7	2	7	59	0	59	45
	Cardiology	18	13	45	3	11	0	11	45
	Neurology	12	13	30	0	1	0	1	45
	Peds Subspecialities	0	0	0	0	0	0	0	45
Dyess	Dermatology	7	19	4	26	134	5	2	40
	Orthopedics	55	27	2	17	223	5	31	32
	ENT/Ophth	55	52	4	41	312	45	124	37
	OB/GYN	8	6	0	0	84	0	75	38
	Cardiology	15	37	18	170	135	40	47	34
	Neurology	67	51	7	0	137	40	1	48
	Peds Subspecialities	0	61	0	0	22	0	0	33
	Total:	1,861	1,106	606	1,382	2,287	419	1,461	
	Total SASA:	3,573	Total Civ:	4,088		Total Referrals:		7,661	

Note: Data collected directly from remote MTFs

Fig. 6. Baseline Access Indicators - FY 1995

referrals were conducted in FY 1995 and more than half of the referrals were to civilian institutions. The fact that over half of the specialty referrals were to civilian institutions suggests that the implementation of telemedicine could have a significant impact in direct care and CHAMPUS recapture. The baseline access data also shows that it takes, on average, forty days to see a specialist in San Antonio from the time a physician at a remote MTF determines that a referral to the SASA is indicated. From the standpoint of access this area seems to provide the greatest opportunity for improvement.

Figures 7 through 10 show the step by step process employed to arrive at the current average cost to the government for a referral by site and specialty. Additional

MEPRS Calculations

Command	Specialty	MEPRS Code	Workload: Total Outpatient & Inpatient Visits	Stepdown Contributing MEPRS	Prestepdown Purified + Direct Expense Med/Den	Prestepdown Purified + Direct Expense Non-Med/Den	Marginal Cost
BAMC	Dermatology	BAPA	39,338	$ 289,184.55	$ 62,610.00	$ 5,744.00	$ 9.09
	Orthopedics	BEAA	20,553	$ 133,317.04	$ 80,050.00	$ 239.00	$ 10.39
	ENT	BBFA	11,356	$ 60,152.64	$ 51,102.00	$ 2,476.00	
	Ophthalmology	BBDA	21,157	$ 98,714.51	$ 38,823.00	$ 6,904.00	
	ENT/Ophth		32,513	$ 158,867.15	$ 89,925.00	$ 9,380.00	$ 7.94
	OB	BCCA	17,747	$ 161,790.46	$ 21,705.00	$ 1,022.00	
	GYN	BCBA	22,609	$ 590,059.88	$ 27,127.00	$ 1,413.00	
	OB/GYN		40,356	$ 751,850.34	$ 48,832.00	$ 2,435.00	$ 19.90
	Cardiology	BACA	58,567	$ 361,583.69	$ 34,883.00	$ 3,734.00	$ 6.83
	Neurology	BAKA	9,790	$ 132,460.50	$ 902.00	$ 369.00	$ 13.66
	Peds Subspecialities	BDAA	34,720	$ 641,820.20	$ 17,759.00	$ 192.00	$ 19.00
WHMC	Dermatology	BAPA	33,646	$ 428,334.79	$ 182,989.00	$ 6,586.00	$ 18.37
	Orthopedics	BEAA	23,962	$ 356,974.55	$ 61,811.00	$ 2,744.00	$ 17.59
	ENT	BBFA	21,940	$ 233,249.50	$ 68,654.00	$ 3,124.00	
	Ophthalmology	BBDA	25,454	$ 186,155.26	$ 163,515.00	$ 17,609.00	
	ENT/Ophth		47,394	$ 419,404.76	$ 232,169.00	$ 20,733.00	$ 14.19
	OB	BCCA	32,285	$ 395,290.73	$ 24,058.00	$ 2,374.00	
	GYN	BCBA	41,435	$ 544,462.27	$ 30,763.00	$ 2,985.00	
	OB/GYN		73,720	$ 939,753.00	$ 54,821.00	$ 5,359.00	$ 13.56
	Cardiology	BACA	35,278	$ 771,128.40	$ 100,193.00	$ 2,230.00	$ 24.76
	Neurology	BAKA	17,921	$ 283,405.46	$ 37,876.00	$ 2,127.00	$ 18.05
	Peds Subspecialities	BDAA	54,874	$ 781,155.38	$ 27,165.00	$ 3,020.00	$ 14.79

Specialty	Marginal Cost BAMC	Marginal Cost WHMC	Average Marginal Cost
Dermatology	$ 9.09	$ 18.37	$ 13.73
Orthopedics	$ 10.39	$ 17.59	$ 13.99
ENT/Ophthalmology	$ 7.94	$ 14.19	$ 11.07
OB/GYN	$ 19.90	$ 13.56	$ 16.73
Cardiology	$ 6.83	$ 24.76	$ 15.80
Neurology	$ 13.66	$ 18.05	$ 15.86
Peds Subspecialities	$ 19.00	$ 14.79	$ 16.90

Notes:
(1) Based on FY-1995 MEPRS data

Fig. 7. MEPRS Calculations

Provider Pay Calculations

Specialty	Average Base Pay (1)	Average Variable Special Pay (2)(3)	Average Additional Special Pay (2)	Average Board Certified Pay (2)(3)	Multi-year Special Pay (2)(4)	Incentive Special Pay (2)	Total Yearly Pay	Total Monthly Pay	Total Hourly Pay (5)	Average Specialty Appt. Time (hours) (6)	Provider Pay per Specialty Appt.
Dermatology	$ 80,000	$ 9,200	$ 15,000	$ 4,000	$ 4,000	$ 14,000	$126,200	$ 10,517	$ 63	0.25	$ 15.65
Orthopedics	$ 80,000	$ 9,200	$ 15,000	$ 4,000	$ 8,000	$ 36,000	$152,200	$ 12,683	$ 75	0.5	$ 37.75
ENT/Ophthalmology	$ 80,000	$ 9,200	$ 15,000	$ 4,000	$ 5,000	$ 27,000	$140,200	$ 11,683	$ 70	0.33	$ 22.95
OB/GYN	$ 80,000	$ 9,200	$ 15,000	$ 4,000	$ 6,000	$ 29,000	$143,200	$ 11,933	$ 71	0.5	$ 35.52
Cardiology	$ 80,000	$ 9,200	$ 15,000	$ 4,000	$ 4,000	$ 36,000	$148,200	$ 12,350	$ 74	0.5	$ 36.76
Neurology	$ 80,000	$ 9,200	$ 15,000	$ 4,000	$ 6,000	$ 13,000	$127,200	$ 10,600	$ 63	0.5	$ 31.55
Peds Subspecialities	$ 80,000	$ 9,200	$ 15,000	$ 4,000	$ 4,000	$ 5,000	$117,200	$ 9,767	$ 58	0.5	$ 29.07
Primary Care (15min)	$ 80,000	$ 9,200	$ 15,000	$ -	$ -	$ -	$104,200	$ 8,683	$ 52	0.25	$ 12.92
Primary Care (20min)										0.33	$ 17.06
Primary Care (30min)										0.5	$ 25.84

Notes:

(1) MEPRS Salary Table; Average officer pay

(2) Air Force Times Medical Pay Tables

(3) Average of years of service (0 - over 22 years)

(4) Based on 3 year pledge

(5) Total hourly pay based on 40 hours per week and one 8 hour duty = 168 hours per month (TRICARE Standard)

(6) New appointments - based on interviews with clinic personnel at BAMC & WHMC

Fig. 8. Provider Pay Calculations

information concerning calculations and/or source of figures can be found in the notes section of each spreadsheet. The cost associated with lost duty days represents the opportunity cost of an active duty member who has to travel to the SASA to be seen in a

Travel and Lost Duty Day Calculations

Remote Site	Average Active Duty Yearly Pay (1)	Average Active Duty Monthly Pay	Average Active Duty Daily Pay	Average # of Days Pts are away when Referred to SASA (2)	Cost Associated with Lost Duty Days (2)(3)	Average TDY/TAD Expenditure Per Referral (2)
Corpus Christi	$ 60,000.00	$ 5,000.00	$ 166.67	2	$ 333.33	$ 109.00
Ft. Polk	$ 60,000.00	$ 5,000.00	$ 166.67	3	$ 500.00	$ 400.00
Goodfellow (4) (5)	$ 60,000.00	$ 5,000.00	$ 166.67	2	$ 333.33	$ 50.00
Laughlin (4) (6)	$ 60,000.00	$ 5,000.00	$ 166.67	1	$ 166.67	$ 30.00
Dyess	$ 60,000.00	$ 5,000.00	$ 166.67	2	$ 333.33	$ 245.80

Notes:

(1) MEPRS Salary Table; Average officer pay + Average enlisted pay / 2

(2) Information supplied by MTF

(3) Avg. AD daily pay * Avg. # of days pts are away when referred to SASA

(4) Command provides transportation to SASA

(5) Parents are reimbursed for transporting children, Avg. TDY for Peds is $184.40, this is reflected in Cost to Govn calculations

(6) Avg. # Days Pts away for Orthopedics Appointments is 2 days, this is reflected in Cost to Govn calculations

Fig. 9. Travel and Lost Duty Day Calculations

Average & Total Cost to the Government for Specialty Referral to the SASA

Remote Site	Specialty	Average Marginal Cost	Cost of Specialist's Time	Travel Expense	Cost Associated with Lost Duty Days	Average Cost to the Government for Specialty Referral to SASA: Active Duty (1)	Average Cost to the Government for Specialty Referral to SASA: Non Active Duty (2)	Number of Specialty Referrals to SASA: Active Duty	Number of Specialty Referrals to SASA: CHAMPUS Eligible	Number of Specialty Referrals to SASA: Over 65	FY-1995 Cost to Government for Referrals to SASA (3)
Corpus Christi	Dermatology	$ 13.73	$ 15.65	$ 109.00	$ 333.33	$ 471.71	$ 29.38	54	85	84	$ 30,437.56
	Orthopedics	$ 13.99	$ 37.75	$ 109.00	$ 333.33	$ 494.07	$ 51.74	14	11	43	$ 9,710.94
	ENT/Ophth	$ 11.07	$ 22.95	$ 109.00	$ 333.33	$ 476.35	$ 34.02	32	41	67	$ 18,917.36
	OB/GYN	$ 16.73	$ 35.52	$ 109.00	$ 333.33	$ 494.58	$ 52.25	5	11	2	$ 3,152.15
	Cardiology	$ 15.80	$ 36.76	$ 109.00	$ 333.33	$ 494.89	$ 52.56	23	12	102	$ 17,374.31
	Neurology	$ 15.86	$ 31.55	$ 109.00	$ 333.33	$ 489.74	$ 47.41	56	60	56	$ 32,925.00
	Peds Subspecialities	$ 16.90	$ 29.07	$ 109.00	$ 333.33	$ -	$ 45.97	0	55	0	$ 2,528.35
Ft. Polk	Dermatology	$ 13.73	$ 15.65	$ 400.00	$ 500.00	$ 929.38	$ 29.38	2	0	0	$ 1,858.76
	Orthopedics	$ 13.99	$ 37.75	$ 400.00	$ 500.00	$ 951.74	$ 51.74	130	29	5	$ 125,485.36
	ENT/Ophth	$ 11.07	$ 22.95	$ 400.00	$ 500.00	$ 934.02	$ 34.02	80	20	0	$ 75,402.00
	OB/GYN	$ 16.73	$ 35.52	$ 400.00	$ 500.00	$ 952.25	$ 52.25	44	0	0	$ 41,899.00
	Cardiology	$ 15.80	$ 36.76	$ 400.00	$ 500.00	$ 952.56	$ 52.56	64	24	40	$ 64,327.68
	Neurology	$ 15.86	$ 31.55	$ 400.00	$ 500.00	$ 947.41	$ 47.41	100	80	0	$ 98,533.80
	Peds Subspecialities	$ 16.90	$ 29.07	$ 400.00	$ 500.00	$ -	$ 45.97	0	280	0	$ 12,871.60
Goodfellow	Dermatology	$ 13.73	$ 15.65	$ 50.00	$ 333.33	$ 412.71	$ 29.38	58	5	1	$ 24,113.46
	Orthopedics	$ 13.99	$ 37.75	$ 50.00	$ 333.33	$ 435.07	$ 51.74	460	16	2	$ 201,063.52
	ENT/Ophth	$ 11.07	$ 22.95	$ 50.00	$ 333.33	$ 417.35	$ 34.02	190	12	3	$ 79,806.80
	OB/GYN	$ 16.73	$ 35.52	$ 50.00	$ 333.33	$ 435.58	$ 52.25	110	2	2	$ 48,122.80
	Cardiology	$ 15.80	$ 36.76	$ 50.00	$ 333.33	$ 435.89	$ 52.56	88	3	4	$ 38,726.24
	Neurology	$ 15.86	$ 31.55	$ 50.00	$ 333.33	$ 430.74	$ 47.41	84	7	1	$ 36,561.44
	Peds Subspecialities	$ 16.90	$ 29.07	$ 184.40	$ 333.33	$ -	$ 45.97	0	20	0	$ 919.40
Laughlin	Dermatology	$ 13.73	$ 15.65	$ 30.00	$ 166.67	$ 226.05	$ 29.38	10	12	20	$ 3,200.66
	Orthopedics	$ 13.99	$ 37.75	$ 60.00	$ 333.33	$ 445.07	$ 51.74	15	30	47	$ 10,660.03
	ENT/Ophth	$ 11.07	$ 22.95	$ 30.00	$ 166.67	$ 230.69	$ 34.02	2	5	15	$ 1,141.78
	OB/GYN	$ 16.73	$ 35.52	$ 30.00	$ 166.67	$ 248.92	$ 52.25	3	7	2	$ 1,217.01
	Cardiology	$ 15.80	$ 36.76	$ 30.00	$ 166.67	$ 249.23	$ 52.56	18	13	45	$ 7,534.62
	Neurology	$ 15.86	$ 31.55	$ 30.00	$ 166.67	$ 244.08	$ 47.41	12	13	30	$ 4,967.59
	Peds Subspecialities	$ 16.90	$ 29.07	$ 30.00	$ 166.67	$ -	$ 45.97	0	0	0	$ -
Dyess	Dermatology	$ 13.73	$ 15.65	$ 245.80	$ 333.33	$ 608.51	$ 29.38	7	19	4	$ 4,935.31
	Orthopedics	$ 13.99	$ 37.75	$ 245.80	$ 333.33	$ 630.87	$ 51.74	55	27	2	$ 36,198.31
	ENT/Ophth	$ 11.07	$ 22.95	$ 245.80	$ 333.33	$ 613.15	$ 34.02	55	52	4	$ 35,628.37
	OB/GYN	$ 16.73	$ 35.52	$ 245.80	$ 333.33	$ 631.38	$ 52.25	8	6	0	$ 5,364.54
	Cardiology	$ 15.80	$ 36.76	$ 245.80	$ 333.33	$ 631.69	$ 52.56	15	37	18	$ 12,366.15
	Neurology	$ 15.86	$ 31.55	$ 245.80	$ 333.33	$ 626.54	$ 47.41	67	51	7	$ 44,727.96
	Peds Subspecialities	$ 16.90	$ 29.07	$ 245.80	$ 333.33	$ -	$ 45.97	0	61	0	$ 2,804.17

Average Regional Cost for a Referral to SASA: $ 258.70 Grand Total: $1,135,484.03

Notes:

(1) Avg. Marg Cost + Specialist's Time + Travel + Cost of Lost Duty Days

(2) Avg. Marg Cost + Specialist's Time

(3) Avg. Cost to Govn (AD) * Number of AD Referrals + Avg. Cost to Govn (Non-AD) * (Number of CHAMPUS + Over 65)

Fig. 10. Average & Total Cost to the Government for Specialty Referrals to the SASA

specialty clinic. The monetary figure represents the cost to the government of the nonproductive time of that member due to a specialty referral. Having the average marginal cost of a specialty visit, cost of the specialist's time, travel expense, and the cost associated with lost duty days, the average cost to the government for both active duty and non-active duty of a specialty referral to the SASA was determined by remote site and specialty. In FY 1995 the regional average for a referral to SASA was $259 and the total cost to the government to see 3,573 referrals in SASA was $1,135,484.

Projections based on the MCG experience indicate that potentially 6,205 telemedicine referrals will be conducted during the pilot year of the program (Sanders 1995). These calculations also took into consideration the referrals to the civilian community. Telemedicine represents an opportunity to bring a portion of those referrals that were conducted in the civilian community back to the MHSS. A breakdown of projected telemedicine usage by remote site and specialty is presented in figure 11.

Figure 12 is a listing of the telemedicine equipment and support elements for the pilot project (Bonner 1996). Estimated life span of the telemedicine equipment is estimated at five to seven years (Bonner 1994). Even with a five to seven year life span spare medical equipment and periodic maintenance were purchased. The first section of the equipment / support list applies to the medical centers and the five remote MTFs. Each of the five remote sites received the same basic telemedicine equipment package. The medical centers also received duplicate equipment packages except in different proportions. The capital expenditure of $1,823,132 for equipment and support was allocated to the projected 6,205 telemedicine referrals in the pilot year resulting in $294

Workload Calculations

Remote Site	Specialty	FY 1995 Number of Specialty Referrals to SASA: Active Duty	CHAMPUS Eligible	Over 65	FY 1995 Number of Specialty Referrals to Civilian Facilities: Active Duty	CHAMPUS Eligible	Over 65	Total Referrals	Estimated Number of Telemedicine Consults During Pilot (1)	Estimated Number of Consults That Still Need Referral (2)
Corpus Christi	Dermatology	54	85	84	2	63	0	288	233	55
	Orthopedics	14	11	43	1	49	0	118	96	22
	ENT/Ophth	32	41	67	8	120	0	268	217	51
	OB/GYN	5	11	2	56	175	0	249	202	47
	Cardiology	23	12	102	10	140	0	287	232	55
	Neurology	56	60	56	4	40	0	216	175	41
	Peds Subspecialities	0	55	0	0	154	0	209	169	40
Ft. Polk	Dermatology	2	0	0	0	0	0	2	2	0
	Orthopedics	130	29	5	0	0	0	164	133	31
	ENT/Ophth	80	20	0	40	20	7	167	135	32
	OB/GYN	44	0	0	8	20	0	72	58	14
	Cardiology	64	24	40	20	77	180	405	328	77
	Neurology	100	80	0	100	120	35	435	352	83
	Peds Subspecialities	0	280	0	0	3	0	283	229	54
Goodfellow	Dermatology	58	5	1	20	20	3	107	87	20
	Orthopedics	460	16	2	352	45	16	891	722	169
	ENT/Ophth	190	12	3	165	69	26	465	377	88
	OB/GYN	110	2	2	190	15	0	319	258	61
	Cardiology	88	3	4	64	9	14	182	147	35
	Neurology	84	7	1	78	15	3	188	152	36
	Peds Subspecialities	0	20	0	0	13	0	33	27	6
Laughlin	Dermatology	10	12	20	0	0	0	42	34	8
	Orthopedics	15	30	47	0	2	0	94	76	18
	ENT/Ophth	2	5	15	0	0	0	22	18	4
	OB/GYN	3	7	2	7	59	0	78	63	15
	Cardiology	18	13	45	3	11	0	90	73	17
	Neurology	12	13	30	0	1	0	56	45	11
	Peds Subspecialities	0	0	0	0	0	0	0	0	0
Dyess	Dermatology	7	19	4	26	134	5	195	158	37
	Orthopedics	55	27	2	17	223	5	329	266	63
	ENT/Ophth	55	52	4	41	312	45	509	412	97
	OB/GYN	8	6	0	0	84	0	98	79	19
	Cardiology	15	37	18	170	135	40	415	336	79
	Neurology	67	51	7	0	137	40	302	245	57
	Peds Subspecialities	0	61	0	0	22	0	83	67	16
	Total:	1861	1106	606	1382	2287	419	7661	6205	1456

Notes:
(1) Total Number of Referrals * .81 {.81 represents the percent of referrals that can be accomplished via Telemedicine vs. traditional transport as documented in literature (Sanders 1995)}
(2) Total Number Referrals * .19 {.19 represents the percent of patients that will still require referral as documented in literature (Sanders

Fig. 11. Workload Calculations

being applied to each projected telemedicine consult. The entire capital expense was initially applied to the pilot year until enough information could be gathered to conduct a payback analysis. It became unnecessary to reallocate the capital expense once the payback analysis was conducted. The payback analysis is discussed later in this chapter.

Telemedicine Equipment / Support List (1)

			Total Cost
Project Management - AT&T GBO			$ 29,171.00
Project Management - AT&T GIS			$ 60,564.00
System Engineering			$ 82,392.00
Warranty and Maintenance (w/ on-site support)			$ 22,228.00
System Training (8 Weeks)			$ 107,375.00
Integrating, Staging, Shipping, & Installing Radiance Systems			$ 163,839.00
Spares for Medical Equipment			$ 14,021.00
WHMC AB Switches			$ 4,034.00
Point-to-Point T1 Lines			$ 59,420.94
Total:			$ 543,044.94

Remote Site Telemedicine Equipment List	Quantity	Cost per Unit	Total Cost
1. CLI Radiance Model 8775 Dual 27" Monitor video system, Supercam NTSC, VHS VCR NTSC, T1 RS449 interface, and CTX/CTX Plus.	5	$ 79,244.25	$ 396,221.25
2. Teleconsulting Base Station Computer System	5	$ 24,299.00	$ 121,495.00
3. Remote Medical Equipment.	5	$ 24,112.00	$ 120,560.00
Total:		$ 127,655.25	$ 638,276.25

Medical Center Telemedicine Equipment List	Quantity	Cost per Unit	Total Cost
1. CLI Radiance Model 8775 Dual 27" Monitor video system, Supercam NTSC, VHS VCR NTSC, T1 RS449 interface, and CTX/CTX Plus.	2	$ 79,244.25	$ 158,488.50
2. Teleconsulting Base Station Computer System	2	$ 24,299.00	$ 48,598.00
3. Specialists Medical Equipment (2)	12	$ 6,064.00	$ 72,768.00
4. Specialists Room Computer System (2)	12	$ 30,163.00	$ 361,956.00
Total:			$ 641,810.50
Grand Total:			$ 1,823,131.69

Notes:
(1) Information derived from AT&T proposal for system implementation
(2) WHMC = 7 / BAMC = 5

Fig. 12. Telemedicine Equipment / Support List

The recurrent communication cost of $184,719 for T-1 lines was allocated in the same manner resulting in $29.77 being applied to each of the 6,205 projected consults (figure 13).

Recurrent Communication Costs (1)

Location	Monthly Cost per T-1 Line
BAMC (2)	$ -
WHMC	$ 1,240.50
Corpus Christi	$ 2,958.79
Ft. Polk	$ 4,199.96
Goodfellow	$ 2,021.50
Laughlin	$ 2,021.50
Dyess	$ 2,951.00
Total:	$ 15,393.25
Annual Cost:	$ 184,719.00

Note:
(1) Information derived from AT&T proposal for system implementation
(2) T1 line at BAMC is being funded by separate project

Fig. 13. Recurrent Communication Costs

Applying the physician cost per consult, allocation cost for equipment / support, and allocated communication costs it was determined that the average regional cost of a telemedicine consult was $376 during the first year of operation. For subsequent years, following payback of capital expenditures during year one, the average cost to the government for a telemedicine consult is only $82. The total cost to the government for telemedicine consults during year one is $2,343,493 and $520,928 a year after year one. In comparing these figures to the SASA referral baseline, it will cost the government $1,208,009 more to use telemedicine during year one, but the government will save $614,556 a year in subsequent years. These figures only address the costs to perform a consult and do not address the potential cost savings attributed to direct care and CHAMPUS recapture.

Average Cost to the Government for Specialty Referral via Telemedicine

Remote Site	Specialty	Attending Physician Pay per Telmed Consult	Specialist Pay per Telmed Consult	Allocated Telemedicine Equipment/Support Cost per Consult	Allocated Telemedicine Communication Cost per Consult	Average Cost to the Government for Telemedicine Consult (Year 1) (1)	Estimated Number of Telemedicine Consults (2)	Estimated Cost to Government for Telemedicine (Year 1) (3)	FY-1995 Cost to Government for Referrals to SASA	Savings Realized with Telemedicine During Year 1 (4)	Average Cost to the Government for Telemedicine Consult After Year 1 (5)	Estimated Cost to Government for Telemedicine (after Year 1) (6)	Annual Savings Realized with Telemedicine After Year 1 (7)
Corpus Christi	Dermatology	$ 12.92	$ 15.65	$ 293.82	$ 29.77	$ 352.16	233	$ 82,053.28	$ 30,437.56	$ (51,615.72)	$ 58.34	$ 13,593.22	$ 16,844.34
	Orthopedics	$ 25.84	$ 37.75	$ 293.82	$ 29.77	$ 387.18	96	$ 37,169.28	$ 9,710.94	$ (27,458.34)	$ 93.36	$ 8,962.56	$ 748.38
	ENT/Ophth	$ 17.06	$ 22.95	$ 293.82	$ 29.77	$ 363.60	217	$ 78,901.20	$ 18,917.36	$ (59,983.84)	$ 69.78	$ 15,142.26	$ 3,775.10
	OB/GYN	$ 25.84	$ 35.52	$ 293.82	$ 29.77	$ 384.95	202	$ 77,759.90	$ 3,152.15	$ (74,607.75)	$ 91.13	$ 18,408.26	$ (15,256.11)
	Cardiology	$ 25.84	$ 36.76	$ 293.82	$ 29.77	$ 386.19	232	$ 89,596.08	$ 17,374.31	$ (72,221.77)	$ 92.37	$ 21,429.84	$ (4,055.53)
	Neurology	$ 25.84	$ 31.55	$ 293.82	$ 29.77	$ 380.98	175	$ 66,671.50	$ 32,925.00	$ (33,746.50)	$ 87.16	$ 15,253.00	$ 17,672.00
	Peds Subspecialities	$ 25.84	$ 29.07	$ 293.82	$ 29.77	$ 378.50	169	$ 63,966.50	$ 2,528.35	$ (61,438.15)	$ 84.68	$ 14,310.92	$ (11,782.57)
Ft. Polk	Dermatology	$ 12.92	$ 15.65	$ 293.82	$ 29.77	$ 352.16	2	$ 704.32	$ 1,858.76	$ 1,154.44	$ 58.34	$ 116.68	$ 1,742.08
	Orthopedics	$ 25.84	$ 37.75	$ 293.82	$ 29.77	$ 387.18	133	$ 51,494.94	$ 125,485.36	$ 73,990.42	$ 93.36	$ 12,416.88	$ 113,068.48
	ENT/Ophth	$ 17.06	$ 22.95	$ 293.82	$ 29.77	$ 363.60	135	$ 49,086.00	$ 75,402.00	$ 26,316.00	$ 69.78	$ 9,420.30	$ 65,981.70
	OB/GYN	$ 25.84	$ 35.52	$ 293.82	$ 29.77	$ 384.95	58	$ 22,327.10	$ 41,899.00	$ 19,571.90	$ 91.13	$ 5,285.54	$ 36,613.46
	Cardiology	$ 25.84	$ 36.76	$ 293.82	$ 29.77	$ 386.19	328	$ 126,670.32	$ 64,327.68	$ (62,342.64)	$ 92.37	$ 30,297.36	$ 34,030.32
	Neurology	$ 25.84	$ 31.55	$ 293.82	$ 29.77	$ 380.98	352	$ 134,104.96	$ 98,533.80	$ (35,571.16)	$ 87.16	$ 30,680.32	$ 67,853.48
	Peds Subspecialities	$ 25.84	$ 29.07	$ 293.82	$ 29.77	$ 378.50	229	$ 86,676.50	$ 12,871.60	$ (73,804.90)	$ 84.68	$ 19,391.72	$ (6,520.12)
Goodfellow	Dermatology	$ 12.92	$ 15.65	$ 293.82	$ 29.77	$ 352.16	87	$ 30,637.92	$ 24,113.46	$ (6,524.46)	$ 58.34	$ 5,075.58	$ 19,037.88
	Orthopedics	$ 25.84	$ 37.75	$ 293.82	$ 29.77	$ 387.18	722	$ 279,543.96	$ 201,063.52	$ (78,480.44)	$ 93.36	$ 67,405.92	$ 133,657.60
	ENT/Ophth	$ 17.06	$ 22.95	$ 293.82	$ 29.77	$ 363.60	377	$ 137,077.20	$ 79,806.80	$ (57,270.40)	$ 69.78	$ 26,307.06	$ 53,499.74
	OB/GYN	$ 25.84	$ 35.52	$ 293.82	$ 29.77	$ 384.95	258	$ 99,317.10	$ 48,122.80	$ (51,194.30)	$ 91.13	$ 23,511.54	$ 24,611.26
	Cardiology	$ 25.84	$ 36.76	$ 293.82	$ 29.77	$ 386.19	147	$ 56,769.93	$ 38,726.24	$ (18,043.69)	$ 92.37	$ 13,578.39	$ 25,147.85
	Neurology	$ 25.84	$ 31.55	$ 293.82	$ 29.77	$ 380.98	152	$ 57,908.96	$ 36,561.44	$ (21,347.52)	$ 87.16	$ 13,248.32	$ 23,313.12
	Peds Subspecialities	$ 25.84	$ 29.07	$ 293.82	$ 29.77	$ 378.50	27	$ 10,219.50	$ 919.40	$ (9,300.10)	$ 84.68	$ 2,286.36	$ (1,366.96)
Laughlin	Dermatology	$ 12.92	$ 15.65	$ 293.82	$ 29.77	$ 352.16	34	$ 11,973.44	$ 3,200.66	$ (8,772.78)	$ 58.34	$ 1,983.56	$ 1,217.10
	Orthopedics	$ 25.84	$ 37.75	$ 293.82	$ 29.77	$ 387.18	76	$ 29,425.68	$ 10,660.03	$ (18,765.65)	$ 93.36	$ 7,095.36	$ 3,564.67
	ENT/Ophth	$ 17.06	$ 22.95	$ 293.82	$ 29.77	$ 363.60	18	$ 6,544.80	$ 1,141.78	$ (5,403.02)	$ 69.78	$ 1,256.04	$ (114.26)
	OB/GYN	$ 25.84	$ 35.52	$ 293.82	$ 29.77	$ 384.95	63	$ 24,251.85	$ 1,217.01	$ (23,034.84)	$ 91.13	$ 5,741.19	$ (4,524.18)
	Cardiology	$ 25.84	$ 36.76	$ 293.82	$ 29.77	$ 386.19	73	$ 28,191.87	$ 7,534.62	$ (20,657.25)	$ 92.37	$ 6,743.01	$ 791.61
	Neurology	$ 25.84	$ 31.55	$ 293.82	$ 29.77	$ 380.98	45	$ 17,144.10	$ 4,967.59	$ (12,176.51)	$ 87.16	$ 3,922.20	$ 1,045.39
	Peds Subspecialities	$ 25.84	$ 29.07	$ 293.82	$ 29.77	$ 378.50	0	$ -	$ -	$ -	$ 84.68	$ -	$ -
Dyess	Dermatology	$ 12.92	$ 15.65	$ 293.82	$ 29.77	$ 352.16	158	$ 55,641.28	$ 4,935.31	$ (50,705.97)	$ 58.34	$ 9,217.72	$ (4,282.41)
	Orthopedics	$ 25.84	$ 37.75	$ 293.82	$ 29.77	$ 387.18	266	$ 102,989.88	$ 36,198.31	$ (66,791.57)	$ 93.36	$ 24,833.76	$ 11,364.55
	ENT/Ophth	$ 17.06	$ 22.95	$ 293.82	$ 29.77	$ 363.60	412	$ 149,803.20	$ 35,628.37	$ (114,174.83)	$ 69.78	$ 28,749.36	$ 6,879.01
	OB/GYN	$ 25.84	$ 35.52	$ 293.82	$ 29.77	$ 384.95	79	$ 30,411.05	$ 5,364.54	$ (25,046.51)	$ 91.13	$ 7,199.27	$ (1,834.73)
	Cardiology	$ 25.84	$ 36.76	$ 293.82	$ 29.77	$ 386.19	336	$ 129,759.84	$ 12,366.15	$ (117,393.69)	$ 92.37	$ 31,036.32	$ (18,670.17)
	Neurology	$ 25.84	$ 31.55	$ 293.82	$ 29.77	$ 380.98	245	$ 93,340.10	$ 44,727.96	$ (48,612.14)	$ 87.16	$ 21,354.20	$ 23,373.76
	Peds Subspecialities	$ 25.84	$ 29.07	$ 293.82	$ 29.77	$ 378.50	67	$ 25,359.50	$ 2,804.17	$ (22,555.33)	$ 84.68	$ 5,673.56	$ (2,869.39)
						Total:	6205	$ 2,343,493.04	$ 1,135,484.03	$ (1,208,009.01)	$ 2,884.10	$ 520,927.58	$614,556.45

Notes:

(1) Attending Physician Pay per Consult + Specialist Pay per Consult + Allocated Telemed Equip/Support Cost per Consult + Allocated Comm Cost per Consult
(2) Number of Specialty Consults conducted in FY-1995 * .81 {Represents percent usage as documented in literature (Sanders 1995)}
(3) Avg. Cost to Govn for Telemed Consult during year 1 * Est Number of Telemed Consults
(4) FY-1995 Cost to Govn - Est Cost to Govn for Telemed during year 1
(5) Attending Physician Pay per Consult + Specialist Pay per Consult + Allocated Comm Cost per Consult
(6) Avg. Cost to Govn for Telemed Consult after year 1 * Est Number of Telemed Consults
(7) FY-1995 Cost to Govn - Est Cost to Govn for Telemed after year 1

Fig. 14. Average Cost to the Government for Speciality Referral via Telemedicine

Figure 14 shows the average cost and total cost to the government for a telemedicine consult by remote site and specialty.

Direct care and CHAMPUS expenses and potential savings are presented in figure 15. The average regional cost for a local direct care referral is $625.60 and $360.79 for a local CHAMPUS referral. Total potential annual savings to the government with the implementation of the telemedicine project in direct care and CHAMPUS is $1,414,811. When potential direct care and CHAMPUS savings are applied to the potential savings

Direct Care and CHAMPUS Costs

Remote Site	Specialty	Average Direct Care Cost per Referral to Civilian Facility (1)	Average CHAMPUS Cost per Referral to Civilian Facility (1)	Number of Specialty Referrals to Civilian Facilities: Active Duty (1)	CHAMPUS Eligible (1)	FY-1995 Direct Care Cost for Referrals to Civilian Facilities (2)	FY-1995 CHAMPUS Cost for Referrals to Civilian Facilities (3)	Estimated Direct Care Cost for Referrals to Civilian Facilities (4)	Estimated CHAMPUS Cost for Referrals to Civilian Facilities (5)	Savings Realized with Telemedicine: Direct Care (6)	CHAMPUS (7)
Corpus Christi	Dermatology	$ 127.00	$ 150.00	2	63	$ 254.00	$ 9,450.00	$ 48.26	$ 1,795.50	$ 205.74	$ 7,654.50
	Orthopedics	$ 500.00	$ 113.00	1	49	$ 500.00	$ 5,537.00	$ 95.00	$ 1,052.03	$ 405.00	$ 4,484.97
	ENT/Ophth	$ 392.00	$ 300.00	8	120	$ 3,136.00	$ 36,000.00	$ 595.84	$ 6,840.00	$ 2,540.16	$ 29,160.00
	OB/GYN	$ 2,670.00	$ 2,400.00	56	175	$ 149,520.00	$ 420,000.00	$ 28,408.80	$ 79,800.00	$121,111.20	$ 340,200.00
	Cardiology	$ 6,800.00	$ 940.00	10	140	$ 68,000.00	$ 131,600.00	$ 12,920.00	$ 25,004.00	$ 55,080.00	$ 106,596.00
	Neurology	$ 5,250.00	$ 822.00	4	40	$ 21,000.00	$ 32,880.00	$ 3,990.00	$ 6,247.20	$ 17,010.00	$ 26,632.80
	Peds Subspecialities	$ -	$ 2,100.00	0	154	$ -	$ 323,400.00	$ -	$ 61,446.00	$ -	$ 261,954.00
							$ -				
Ft. Polk	Dermatology	$ -	$ -	0	0	$ -	$ -	$ -	$ -	$ -	$ -
	Orthopedics	$ -	$ -	0	0	$ -	$ -	$ -	$ -	$ -	$ -
	ENT/Ophth	$ 870.00	$ -	40	20	$ 52,200.00	$ -	$ 6,612.00	$ -	$ 45,588.00	$ -
	OB/GYN	$ 430.00	$ -	8	20	$ 12,040.00	$ -	$ 653.60	$ -	$ 11,386.40	$ -
	Cardiology	$ 986.00	$ -	20	77	$ 95,642.00	$ -	$ 3,746.80	$ -	$ 91,895.20	$ -
	Neurology	$ 475.00	$ -	100	120	$ 104,500.00	$ -	$ 9,025.00	$ -	$ 95,475.00	$ -
	Peds Subspecialities	$ 114.00	$ -	0	3	$ 342.00	$ -	$ -	$ -	$ 342.00	$ -
							$ -				
Goodfellow	Dermatology	$ 32.00	$ 32.00	20	20	$ 640.00	$ 640.00	$ 121.60	$ 121.60	$ 518.40	$ 518.40
	Orthopedics	$ 120.00	$ 120.00	352	45	$ 42,240.00	$ 5,400.00	$ 8,025.60	$ 1,026.00	$ 34,214.40	$ 4,374.00
	ENT/Ophth	$ 65.00	$ 65.00	165	69	$ 10,725.00	$ 4,485.00	$ 2,037.75	$ 852.15	$ 8,687.25	$ 3,632.85
	OB/GYN	$ 120.00	$ 120.00	190	15	$ 22,800.00	$ 1,800.00	$ 4,332.00	$ 342.00	$ 18,468.00	$ 1,458.00
	Cardiology	$ 65.00	$ 65.00	64	9	$ 4,160.00	$ 585.00	$ 790.40	$ 111.15	$ 3,369.60	$ 473.85
	Neurology	$ 140.00	$ 140.00	78	15	$ 10,920.00	$ 2,100.00	$ 2,074.80	$ 399.00	$ 8,845.20	$ 1,701.00
	Peds Subspecialities	$ -	$ 150.00	0	13	$ -	$ 1,950.00	$ -	$ 370.50	$ -	$ 1,579.50
							$ -				
Laughlin	Dermatology	$ -	$ -	0	0	$ -	$ -	$ -	$ -	$ -	$ -
	Orthopedics	$ -	$ 4,000.00	0	2	$ -	$ 8,000.00	$ -	$ 1,520.00	$ -	$ 6,480.00
	ENT/Ophth	$ -	$ -	0	0	$ -	$ -	$ -	$ -	$ -	$ -
	OB/GYN	$ 714.00	$ 68.00	7	59	$ 4,998.00	$ 4,012.00	$ 949.62	$ 762.28	$ 4,048.38	$ 3,249.72
	Cardiology	$ 1,333.00	$ 318.00	3	11	$ 3,999.00	$ 3,498.00	$ 759.81	$ 664.62	$ 3,239.19	$ 2,833.38
	Neurology	$ -	$ 162.00	0	1	$ -	$ 162.00	$ -	$ 30.78	$ -	$ 131.22
	Peds Subspecialities	$ -	$ -	0	0	$ -	$ -	$ -	$ -	$ -	$ -
							$ -				
Dyess	Dermatology	$ 99.00	$ 49.58	26	134	$ 2,574.00	$ 6,643.72	$ 489.06	$ 1,262.31	$ 2,084.94	$ 5,381.41
	Orthopedics	$ 99.00	$ 48.41	17	223	$ 1,683.00	$ 10,795.43	$ 319.77	$ 2,051.13	$ 1,363.23	$ 8,744.30
	ENT/Ophth	$ 99.00	$ 104.29	41	312	$ 4,059.00	$ 32,538.48	$ 771.21	$ 6,182.31	$ 3,287.79	$ 26,356.17
	OB/GYN	$ 99.00	$ 112.88	0	84	$ -	$ 9,481.92	$ -	$ 1,801.56	$ -	$ 7,680.36
	Cardiology	$ 99.00	$ 95.60	170	135	$ 16,830.00	$ 12,906.00	$ 3,197.70	$ 2,452.14	$ 13,632.30	$ 10,453.86
	Neurology	$ -	$ 81.31	0	137	$ -	$ 11,139.47	$ -	$ 2,116.50	$ -	$ 9,022.97
	Peds Subspecialities	$ -	$ 70.71	0	22	$ -	$ 1,555.62	$ -	$ 295.57	$ -	$ 1,260.05
			Total:	1382	2,287	$ 632,762.00	$ 1,076,559.64	$ 89,964.62	$ 204,546.33	$542,797.38	$ 872,013.31
										Total savings:	$1,414,810.69

Notes:
(1) Data collected directly from remote MTFs
(2) Avg. Direct Care Cost per Referral * Number of Active Duty Referrals in FY-1995 (Ft.Polk used Direct Care funds to pay for CHAMPUS Eligible patient referrals in FY-1995)
(3) Avg. CHAMPUS Cost per Referral * Number of CHAMPUS Eligible Referrals in FY-1995
(4) (Number of Active Duty Referrals * .19) * (Avg. Direct Care Cost per Referral) {.19 represents the percent of patients that will require referral as documented in literature (Sanders 1995)}
(5) (Number of CHAMPUS Eligible Referrals * .19) * (Avg. CHAMPUS Cost per Referral) {.19 represents the percent of patients that will require referral as documented in literature (Sanders 1995
(6) FY-1995 Direct Care Cost for Referrals - Est Direct Care Cost for Referrals
(7) FY-1995 CHAMPUS Cost for Referrals - Est CHAMPUS Cost for Referrals

Fig. 15. Direct Care and CHAMPUS Costs

(and loss in year one) of conducting both telemedicine consults and the fraction (19 percent) of consults that still require traditional referral result in a loss of $8,547 in year one and an annual savings of $1,814,585 after year one.

Using information collected in figures 10, 14, 15 and 16, a payback analysis was conducted. This analysis indicates that the capital expenditure for purchase of the telemedicine equipment and support will be recovered (within $8,547) in the first year

Traditional Referrals to the SASA with Telemedicine

		FY 1995 Number of Specialty Referrals to SASA			Estimated Number of Consults That Still Need Referral		Average Cost to the Government for Specialty Referral to SASA		Cost to Government for Referrals to SASA	
Remote Site	Specialty	Active Duty	CHAMPUS Eligible	Over 65	Active Duty (1)	Non Active Duty (2)	Active Duty	Non Active Duty	Active Duty (3)	Non Active Duty (4)
Corpus Christi	Dermatology	54	85	84	10	32	$ 471.71	$ 29.38	$ 4,717.10	$ 940.16
	Orthopedics	14	11	43	3	10	$ 494.07	$ 51.74	$ 1,482.21	$ 517.40
	ENT/Ophth	32	41	67	6	21	$ 476.35	$ 34.02	$ 2,858.10	$ 714.42
	OB/GYN	5	11	2	1	2	$ 494.58	$ 52.25	$ 494.58	$ 104.50
	Cardiology	23	12	102	4	22	$ 494.89	$ 52.56	$ 1,979.56	$ 1,156.32
	Neurology	56	60	56	11	22	$ 489.74	$ 47.41	$ 5,387.14	$ 1,043.02
	Peds Subspecialities	0	55	0	0	10	$ -	$ 45.97	$ -	$ 459.70
Ft. Polk	Dermatology	2	0	0	0	0	$ 929.38	$ 29.38	$ -	$ -
	Orthopedics	130	29	5	25	6	$ 951.74	$ 51.74	$ 23,793.50	$ 310.44
	ENT/Ophth	80	20	0	15	4	$ 934.02	$ 34.02	$ 14,010.30	$ 136.08
	OB/GYN	44	0	0	8	0	$ 952.25	$ 52.25	$ 7,618.00	$ -
	Cardiology	64	24	40	12	12	$ 952.56	$ 52.56	$ 11,430.72	$ 630.72
	Neurology	100	80	0	19	15	$ 947.41	$ 47.41	$ 18,000.79	$ 711.15
	Peds Subspecialities	0	280	0	0	53	$ -	$ 45.97	$ -	$ 2,436.41
Goodfellow	Dermatology	58	5	1	11	1	$ 412.71	$ 29.38	$ 4,539.81	$ 29.38
	Orthopedics	460	16	2	87	3	$ 435.07	$ 51.74	$ 37,851.09	$ 155.22
	ENT/Ophth	190	12	3	36	3	$ 417.35	$ 34.02	$ 15,024.60	$ 102.06
	OB/GYN	110	2	2	21	1	$ 435.58	$ 52.25	$ 9,147.18	$ 52.25
	Cardiology	88	3	4	17	1	$ 435.89	$ 52.56	$ 7,410.13	$ 52.56
	Neurology	84	7	1	16	2	$ 430.74	$ 47.41	$ 6,891.84	$ 94.82
	Peds Subspecialities	0	20	0	0	4	$ -	$ 45.97	$ -	$ 183.88
Laughlin	Dermatology	10	12	20	2	6	$ 226.05	$ 29.38	$ 452.10	$ 176.28
	Orthopedics	15	30	47	3	15	$ 445.07	$ 51.74	$ 1,335.21	$ 776.10
	ENT/Ophth	2	5	15	0	4	$ 230.69	$ 34.02	$ 87.66	$ 136.08
	OB/GYN	3	7	2	1	2	$ 248.92	$ 52.25	$ 248.92	$ 104.50
	Cardiology	18	13	45	3	11	$ 249.23	$ 52.56	$ 747.69	$ 578.16
	Neurology	12	13	30	2	8	$ 244.08	$ 47.41	$ 488.16	$ 379.28
	Peds Subspecialities	0	0	0	0	0	$ -	$ 45.97	$ -	$ -
Dyess	Dermatology	7	19	4	1	4	$ 608.51	$ 29.38	$ 608.51	$ 117.52
	Orthopedics	55	27	2	10	6	$ 630.87	$ 51.74	$ 6,308.70	$ 310.44
	ENT/Ophth	55	52	4	10	11	$ 613.15	$ 34.02	$ 6,131.50	$ 374.22
	OB/GYN	8	6	0	2	1	$ 631.38	$ 52.25	$ 1,262.76	$ 52.25
	Cardiology	15	37	18	3	10	$ 631.69	$ 52.56	$ 1,895.07	$ 525.60
	Neurology	67	51	7	13	11	$ 626.54	$ 47.41	$ 8,145.02	$ 521.51
	Peds Subspecialities	0	61	0	0	12	$ -	$ 45.97	$ -	$ 551.64
	Total:				352	325			$ 200,347.95	$ 14,434.07
							Grand Total:			$ 214,782.02

Notes:
(1) Number of active duty referrals * .19 {.19 represents the percent of referrals that will still need traditional referral as documented in literature (Sanders 1995
(2) Total number of non-active duty Referrals * .19 {.19 represents the percent of patients that will still require referral as documented in literature (Sanders 199
(4) Number of non-active duty referrals * Avg. cost for non-active duty referral
(3) Number of active duty referrals * Avg. cost for active duty referral

Fig. 16. Traditional Referrals to the SASA with Telemedicine

(figure 17). A net present value was calculated on the current referral system (figure 18), expenses associated with the telemedicine project (figure 19) and a combination of cost avoidance and expense with telemedicine (figure 20). Following discussions with the TRICARE comptroller it was determined to set the nominal interest rate conservatively at 7.60 percent and the nominal inflation rate at 3 percent for the NPV calculations (Kanwischer 1996). Projecting through FY 2000 the NPV for the current referral system is negative $11,151,897, the NPV of the telemedicine project without figuring in cost avoidance is negative $4,653,061, but figuring in the cost avoidance the NPV of the telemedicine project is a positive $2,056,228. Notes for all three NPV calculations are

Payback Analysis

Cash Flow

		YR1	YR2
Cost Savings*		$1,814,585	$1,814,585
Capital Equipment		($1,823,132)	
Cash Flow		($8,547)	$1,814,585
Payback (Years)	1.00		

* Cost savings derived as explained below:

Current costs of referrals to SASA (1)	$	1,135,484
Current Local Referrals (Direct Care) Costs (2)	$	632,762
Current Local Referrals (CHAMPUS) Costs (2)	$	1,076,560
TOTAL Current Cost to Govn.	$	2,844,806
Less:		
Cost of Telemedicine Referrals to SASA (includes Allocation of annual $184,719 Comm Costs) (3)	$	(520,928)
Referrals still sent to SASA (4)	$	(214,782)
Local referrals (Direct Care) still sent (2)	$	(89,965)
Local referrals (CHAMPUS) still sent (2)	$	(204,546)
Cost to Govn. w/ Telemed	$	(1,030,221)
Potential Yearly Savings	$	1,814,585
Capital Investment:		
Telemed Equipment/Support Costs	$	1,823,132
TOTAL	$	1,823,132

Notes:
(1) See figure 10
(2) See figure 15
(3) See figure 14
(4) See figure 16

Fig. 17. Payback Analysis

Net Present Value Analysis: Maintain Existing Referral Structure						
Workload		FY-1996	FY-1997	FY-1998	FY-1999	FY-2000
Traditional Referrals						
Referrals to SASA		3,573	3,573	3,573	3,573	3,573
Local Referrals (Direct Care)		1,382	1,382	1,382	1,382	1,382
Local Referrals (CHAMPUS)		2,287	2,287	2,287	2,287	2,287
Annual Operating Expenses (Cost of Referrals)						
Referrals to SASA		$ (924,335)	$ (952,065)	$ (980,627)	$ (1,010,046)	$ (1,040,347)
Local Referrals (Direct Care)		$ (864,579)	$ (890,517)	$ (917,232)	$ (944,749)	$ (973,092)
Local Referrals (CHAMPUS)		$ (825,127)	$ (849,881)	$ (875,377)	$ (901,638)	$ (928,687)
Total Referral Cost		$ (2,614,041)	$ (2,692,462)	$ (2,773,236)	$ (2,856,433)	$ (2,942,126)
Cash Flow (Expenses)		$ (2,614,041)	$ (2,692,462)	$ (2,773,236)	$ (2,856,433)	$ (2,942,126)
Less:						
- Est. Capital Expend		0	0	0	0	0
Net Free Cash Flow		$ (2,614,041)	$ (2,692,462)	$ (2,773,236)	$ (2,856,433)	$ (2,942,126)
Interest Rate:	7.60%					
Net Present Value:	$ (11,151,897)					

Fig. 18. Net Present Value Analysis: Maintain Existing Referral Structure

Net Present Value Analysis: Telemedicine (Expenses)						
Workload		FY-1996	FY-1997	FY-1998	FY-1999	FY-2000
Traditional Referrals						
Referrals to SASA		679	679	679	679	679
Local Referrals (Direct Care)		263	263	263	263	263
Local Referrals (CHAMPUS)		435	435	435	435	435
Telemedicine Referrals						
Referrals to SASA		6,205	6,205	6,205	6,205	6,205
Annual Operating Expenses						
Traditional Referrals						
Referrals to SASA		$ (175,624)	$ (180,892)	$ (186,319)	$ (191,909)	$ (197,666)
Local Referrals (Direct Care)		$ (164,270)	$ (169,198)	$ (174,274)	$ (179,502)	$ (184,887)
Local Referrals (CHAMPUS)		$ (156,774)	$ (161,477)	$ (166,322)	$ (171,311)	$ (176,451)
Telemedicine Referrals						
Referrals to SASA		$ (508,810)	$ (524,074)	$ (539,797)	$ (555,990)	$ (572,670)
Communications		$ (184,719)	$ (190,261)	$ (195,968)	$ (201,847)	$ (207,903)
Cash Flow		$ (693,529)	$ (714,335)	$ (735,765)	$ (757,838)	$ (780,573)
Cash Flow		$ (693,529)	$ (714,335)	$ (735,765)	$ (757,838)	$ (780,573)
Less:						
- Est. Capital Expend		$ (1,823,132)	$ -	$ -	$ -	$ -
Net Free Cash Flow		$ (2,516,661)	$ (714,335)	$ (735,765)	$ (757,838)	$ (780,573)
Interest Rate:	7.60%					
Net Present Value:	$ (4,653,061)					

Fig. 19. Net Present Value Analysis: Telemedicine (Expenses)

Net Present Value Analysis: Telemedicine (Cost Avoidance & Expenses)					
Cost Avoidance:					
Workload (Avoided)	FY-1996	FY-1997	FY-1998	FY-1999	FY-2000
Traditional Referrals					
Referrals to SASA	2,894	2,894	2,894	2,894	2,894
Local Referrals (Direct Care)	1,119	1,119	1,119	1,119	1,119
Local Referrals (CHAMPUS)	1,852	1,852	1,852	1,852	1,852
Cost Avoidance					
Traditional Referrals					
Referrals to SASA	$ 748,711	$ 771,173	$ 794,308	$ 818,137	$ 842,681
Local Referrals (Direct Care)	$ 700,309	$ 721,318	$ 742,958	$ 765,247	$ 788,204
Local Referrals (CHAMPUS)	$ 668,353	$ 688,403	$ 709,055	$ 730,327	$ 752,237
Expense					
Workload					
Traditional Referrals					
Referrals to SASA	679	679	679	679	679
Local Referrals (Direct Care)	263	263	263	263	263
Local Referrals (CHAMPUS)	435	435	435	435	435
Telemedicine Referrals					
Referrals to SASA	6,205	6,205	6,205	6,205	6,205
Annual Operating Expenses					
Traditional Referrals					
Referrals to SASA	$ (175,624)	$ (180,892)	$ (186,319)	$ (191,909)	$ (197,666)
Local Referrals (Direct Care)	$ (164,270)	$ (169,198)	$ (174,274)	$ (179,502)	$ (184,887)
Local Referrals (CHAMPUS)	$ (156,774)	$ (161,477)	$ (166,322)	$ (171,311)	$ (176,451)
Telemedicine Referrals					
Referrals to SASA	$ (508,810)	$ (524,074)	$ (539,797)	$ (555,990)	$ (572,670)
Communications	$ (184,719)	$ (190,261)	$ (195,968)	$ (201,847)	$ (207,903)
Cash Flow (Cost Avoidance - Expenses)	$ 927,176	$ 954,992	$ 983,641	$ 1,013,151	$ 1,043,545
Cash Flow	$ 927,176	$ 954,992	$ 983,641	$ 1,013,151	$ 1,043,545
Less:					
- Est. Capital Expend	$(1,823,132)	$ -	$ -	$ -	$ -
Net Free Cash Flow	$ (895,955)	$ 954,992	$ 983,641	$ 1,013,151	$ 1,043,545
Interest Rate: 7.60%					
Net Present Value: $ 2,261,116					

Notes:
(1) Nominal Interest Rate: 7.60%
(2) Nominal Inflation Rate: 3.00%
(3) No Revenue - so analysis is of cost avoidance's and/or expenses
(4) Demand increases at 0%
(5) From Baseline Analysis:
Number of Traditional Specialty Referrals to SASA (Annual): 3,573; Avg. Regional Cost per: $258.70
Number of Local Specialty Referrals (Direct Care) (Annual): 1382; Avg. Regional Cost per: $625.60
Number of Local Specialty Referrals (CHAMPUS) (Annual): 2287; Avg. Regional Cost per: $360.79
Estimate Number of Telemedicine Consults (Annual): 6205; Avg. Cost per: $82 (w/o allocation of Equip/Sup Costs)
Estimate Number of Traditional Specialty Referrals to SASA w/ Telemed (referrals still sent): 679
Estimate Number of Local Specialty Referrals (Direct Care) w/ Telemed (referrals still sent): 263
Estimate Number of Local Specialty Referrals (CHAMPUS) w/ Telemed (referrals still sent): 435

Fig. 20. Net Present Value Analysis: Telemedicine (Cost Avoidance & Expenses)

included at the bottom of figure 20. Payback calculated at one year and a positive NPV indicate that, based on projected usage, the telemedicine pilot project will be cost effective thus meeting objective 4 of the project. The projected data will be substituted

Summary of Significant Findings

	Current System	Telemedicine (Year 1)	Telemedicine (After Year 1)
Avg. Cost per Referral to SASA	$ 259	$ 376	$ 82
Total Cost to Govn. for Referrals to SASA	$ 1,135,484	$ 2,343,493	$ 520,928
Direct Care / CHAMPUS Recapture	N/A	$ 1,414,811	$ 1,414,811
Annual Savings to Govn. with Telmed	N/A	$ (8,547)	$ 1,814,585
NPV	$ (11,151,897)	$ 2,261,116	$ 2,261,116
Capital Expenditure Payback: 1 Year			

Fig. 21. Summary of Significant Findings

with actual referral data (via the telemedicine data collection tool) during the pilot project. Summary of significant findings are presented in figure 21.

Figure 22 sets the baseline for objective 5 by showing the cross service referrals within the region for FY 1995. At the completion of the pilot project actual cross service referral numbers will be able to be compared to this baseline. Complete evaluation of the goal and objectives of the telemedicine pilot project will have to wait until the end of the pilot, but the goals of this management project have been met.

Cross Service Referrals - FY 1995		
Army to Army		853
Army to Air Force		45
Air Force to Army		1764
Air Force to Air Force		598
Navy to Army		163
Navy to Air Force		650

Fig. 22. Cross Service Referrals - FY 1995

Conclusions

A review of the access and cost aspects of the regional specialty referral process has been completed resulting in the creation of comprehensive baseline that will be used in the evaluation of the Region VI telemedicine pilot project. A data collection tool along with data collection procedures have also been created and implemented as part of this management project. Data elements and procedures for assessing successful completion were developed for each of the telemedicine project's primary objectives. Using documented usage rates projections were calculated allowing for payback and net present value analyses. Based on those calculations the capital expenditure for the telemedicine pilot project will be covered within one year and the project itself will generate a positive net present value. The literature concerning cost and access evaluation of telemedicine were notorious for caveating the effects of telemedicine with 'mays' and 'has the potential to . . .'. The officers who complete the final evaluation of the pilot project will be able to make definitive statements concerning the cost, access, and satisfaction of telemedicine in Region VI. From all indications, I feel these statements will be positive.

Note

The opinions or assertions contained herein are the private views of the author and are not to be construed as reflecting the views of TRICARE Southwest; U.S. Department of the Air Force; U.S. Department of the Navy; or the U.S. Department of Defense.

APPENDIX 1
MEDICAL TREATMENT FACILITY PROFILE
Wilford Hall Medical Center
Lackland, AFB

CATCHMENT AREA DEMOGRAPHICS[1]	
Active Duty	35,543
Active Duty Family Members	46,324
Retired	40,423
Retired Family Members	53,883
Medical Eligible NG/Reserve	3,723
Family Members NG/Reserve	1,364
Survivors	9,410
Total	190,670

MTF CAPACITY [2]	
Operating Beds	5
Expansion Capability	1021

AUTHORIZED FACILITY STAFFING[2]	
Medical Corps	228
Dental Corps	57
Medical Service Corps	44
Nurse Corps	585
Biomedical Sciences Corps	134
Non-Medical	12
Enlisted	2131
Civilian	923
Residents (Officers)	459
Total	4573

MTF WORKLOAD[2,3]	
Total Dispositions	26,708
Total Occupied Bed Days	163,572
Total Outpatient Visits	938,933

Source: 1 - RAPS, FY 94 based on FY 93 baseline. Reflects San Antonio service area
2 - Provided by MTF
3 - MEPRS, FY 94

(Carlton 1995)

MEDICAL TREATMENT FACILITY PROFILE
Brooke Army Medical Center
Fort Sam Houston, TX

CATCHMENT AREA DEMOGRAPHICS[1]

Active Duty	35,543
Active Duty Family Members	46,324
Retired	40,423
Retired Family Members	53,883
Medical Eligible NG/Reserve	3,723
Family Members NG/Reserve	1,364
Survivors	9,410
Total	190,670

MTF CAPACITY[2]

	Current Facility	New BAMC
Operating Beds	458*	450*
Expansion Capability	1000	653
*Includes Burn Center Beds		

AUTHORIZED FACILITY STAFFING[2]

Medical Corps	296
Dental Corps	33
Medical Service Corps	72
Nurse Corps	280
Army Medical Specialist	25
Warrant Officers	3
Enlisted	958
Civilian	1374
Total	3041

MTF WORKLOAD[2,3]

Total Dispositions	20,253
Total Occupied Bed Days	108,391
Total Outpatient Visits	784,764

Source: 1 - RAPS, FY 94 based on FY 93 baseline. Reflects San Antonio service area
2 - Provided by MTF
3 - MEPRS, FY 94

(Carlton 1995)

MEDICAL TREATMENT FACILITY PROFILE
Naval Hospital
Corpus Christi, Texas

CATCHMENT AREA DEMOGRAPHICS [1]

Active Duty	4786
Active Duty Family Members	7911
Retired	4519
Retired Family Members	6285
Medical Eligible NG/Reserve	257
Family Members NG/Reserve	468
Survivors	895
Total	25,121

MTF CAPACITY [2]

Operating Beds	42
Expansion Capacity	65

Note: Naval Hospital, Corpus Christi also operates two branch clinics located at Kingsville and Ingleside

AUTHORIZED FACILITY STAFFING [2]

Medical Corps	26
Medical Service Corps	22
Nurse Corps	32
Civil Engineer Corps	1
Chaplain	1
Enlisted	331
Civilian	126
Total	539

MTF WORKLOAD [2,3]

Total Dispositions	2,072
Total Occupied Bed Days	8,487
Total Outpatient Visits	121,580

Source: 1 - RAPS, FY94 based on FY 93 baseline
2 - Provided by MTF
3 - MEPRS, FY 94

(Calton 1995)

MEDICAL TREATMENT FACILITY PROFILE
Bayne-Jones Army Community Hospital
Fort Polk, Louisiana

CATCHMENT AREA DEMOGRAPHICS [1]	
Active Duty	11,964
Active Duty Family Members	12,843
Retired	2,831
Retired Family Members	4,394
Medical Eligible NG/Reserve	68
Family Members NG/Reserve	158
Survivors	645
Total	32,933
MTF CAPACITY [2]	
Operating Beds	52
Expansion Capability	169
AUTHORIZED FACILITY STAFFING [2]	
Medical Corps	45
Dental Corps	16
Medical Service Corps	20
Nurse Corps	61
Army Medical Specialist Corps	4
Veterinary Corps	3
Chaplain	1
Warrant Officer	2
Enlisted	239
Civilian	427
Total	818
MTF WORKLOAD [2,3]	
Total Dispositions	5,426
Total Occupied Bed Days	14,276
Total Outpatient Visits	337,191

Source: 1 - RAPS, FY 94 based on FY 93 baseline
2 - Provided by MTF
3 - MEPRS, FY 94

(Carlton 1995)

MEDICAL TREATMENT FACILITY PROFILE
17th Medical Group
Goodfellow AFB, Texas

CATCHMENT AREA DEMOGRAPHICS[1]

Active Duty	2,466
Active Duty Family Members	3,895
Retired	1,922
Retired Family Members	2,577
Medical Eligible NG/Reserve	45
Family Members NG/Reserve	55
Survivors	379
Total	11,339

MTF CAPACITY[2]

The 17th Medical Group has no inpatient capability

AUTHORIZED FACILITY STAFFING[2]

Medical Corps	6
Dental Corps	5
Medical Service Corps	5
Nurse Corps	4
Biomedical Sciences Corps	9
Enlisted	76
Civilian	27
Total	132

MTF WORKLOAD[2,3]

Total Outpatient Visits	53,151
X-rays	16,872
Weighted Lab Procedures	284,448
Prescriptions	148,608

Source: 1 - RAPS, FY 94 based on FY 93 baseline (40 mile catchment area)
2 - Provided by MTF. Ancillary workload derived from monthly average.
3 - MEPRS, FY 94

(Carlton 1995)

MEDICAL TREATMENT FACILITY PROFILE
47th Medical Group
Laughlin AFB, Texas

CATCHMENT AREA DEMOGRAPHICS [1]	
Active Duty	1,271
Active Duty Family Members	1,675
Retired	830
Retired Family Members	1,192
Medical Eligible NG/Reserve	0
Family Members NG/Reserve	19
Survivors	138
Total	5,125
MTF CAPACITY [2]	
Operating Beds	7
Expansion Capability	28
AUTHORIZED FACILITY STAFFING [2]	
Medical Corps	14
Dental Corps	4
Medical Service Corps	6
Nurse Corps	29
Biomedical Sciences Corps	9
Enlisted	139
Civilian	28
Total	229
MTF WORKLOAD [2,3]	
Average Daily Census	4
Total Dispositions	638
Total Occupied Bed Days	1,355
Total Outpatient Visits	42,110

Source: 1 - RAPS, FY 94 based on FY 93 baseline
2 - Provided by MTF
3 - MEPRS, FY 94

(Carlton 1995)

MEDICAL TREATMENT FACILITY PROFILE
7th Medical Group
Dyess AFB, Texas

CATCHMENT AREA DEMOGRAPHICS [1]	
Active Duty	5208
Active Duty Family Members	8723
Retired	3055
Retired Family Members	4597
Medical Eligible NG/Reserve	50
Family Members NG/Reserve	63
Survivors	529
Total	22,225
MTF CAPACITY [2]	
Operating Beds	15
Expansion Capability	100
AUTHORIZED FACILITY STAFFING [2]	
Medical Corps	27
Dental Corps	11
Medical Service Corps	7
Nurse Corps	41
Biomedical Sciences Corps	16
Enlisted	208
Civilian	57
Total	367
MTF WORKLOAD [2,3]	
Total Dispositions	1,745
Total Occupied Bed Days	3,683
Total Outpatient Visits	138,920

Source: 1 - RAPS, FY 94 based on FY 93 baseline
2 - Provided by MTF
3 - MEPRS, FY 94

(Carlton 1995)

TRICARE SOUTHWEST

Telemedicine Network – Linking Region VI

TRICARE Southwest
Telemedicine Project

USE NO. 2 PENCIL ONLY

- Fill in bubbles completely
- Make no stray marks

1 REFERRAL SOURCE
- ◯ MHSS
- ◯ Civilian Network

3 REMOTE MTF (Physical Location of Patient)
- ◯ WHMC
- ◯ BAMC
- ◯ Ft Hood
- ◯ Ft Polk
- ◯ Corpus Christi NAS
- ◯ Dyess AFB
- ◯ Goodfellow AFB
- ◯ Laughlin AFB

4 DATE SERVICES PERFORMED

MO DY YR

0 1 2 3 4 5 6 7 8 9

5 PROVIDER SPECIALTY OUTPATIENT MEPR

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

2 TYPE OF CONSULT
- ◯ Interactive
- ◯ Non-Interactive

8 MEDICAL CENTER (Consultant Location)
- ◯ WHMC
- ◯ BAMC

9 DATE SERVICES PERFORMED

MO DY YR

0 1 2 3 4 5 6 7 8 9

10 PROVIDER SPECIALTY OUTPATIENT MEPR

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

6 PROVIDER SSAN

0 1 2 3 4 5 6 7 8 9

7 CONSULT SCHEDULED

MO DY YR

0 1 2 3 4 5 6 7 8 9

11 PROVIDER SSAN

0 1 2 3 4 5 6 7 8 9

12 PATIENT VISIT TYPE (REMOTE MTF)

ESTABLISHED
- ◯ 99211 - Minimal/5 min
- ◯ 99212 - Straightforward/10 min
- ◯ 99213 - Low Complex/15 min
- ◯ 99214 - Moderate Complex/25 min
- ◯ 99215 - High Complex/40 min

NEW
- ◯ 99201 - Straightforward/10 min
- ◯ 99202 - Straightforward/20 min
- ◯ 99203 - Low Complex/30 min
- ◯ 99204 - Moderate Complex/45 min
- ◯ 99205 - High Complex/60 min

13 FMP/SPONSOR SSAN

0 1 2 3 4 5 6 7 8 9

14 STATUS (Please Choose One Only)
- ◯ Active Duty
- ◯ CHAMPUS Eligible
- ◯ Age 65/Over

15 PATIENT OR SPONSOR PAYGRADE

◯ E ◯ W ◯ O

◯ 1 ◯ 2 ◯ 3 ◯ 4 ◯ 5 ◯ 6 ◯ 7 ◯ 8 ◯ 9 ◯ 10

16 PATIENT VISIT TYPE (Medical Center)

OUTPATIENT CONSULTATION
- ◯ 99241 - Straightforward/15 min
- ◯ 99242 - Straightforward/30 min
- ◯ 99243 - Low Complex/40 min
- ◯ 99244 - Moderate Complex/60 min
- ◯ 99245 - High Complex/80 min

INITIAL INPATIENT CONSULTATION
- ◯ 99251 - Straightforward/20 min
- ◯ 99252 - Straightforward/40 min
- ◯ 99253 - Low Complex/55 min
- ◯ 99254 - Moderate Complex/80 min
- ◯ 99255 - High Complex/110 min

FOLLOW-UP INPATIENT CONSULTATION
- ◯ 99261 - Straightforward/10 min
- ◯ 99262 - Moderate Complex/20 min
- ◯ 99263 - High Complex/50 min

CONFIRMATORY CONSULTATION
- ◯ 99271 - Straightforward/Problem - Minor
- ◯ 99272 - Straightforward/Problem - Low Severity
- ◯ 99273 - Low Complex/Problem - Moderate
- ◯ 99274 - Moderate Complex/Problem - Moderate
- ◯ 99275 - High Complex/Problem - High Severity

17

ACTUAL TIME WITH PATIENT/CONSULT			
a. Remote MTF		b. Medical Center	
Hours	Minutes	Hours	Minutes
0	0 0	0	0 0
1	1 1	1	1 1
2	2 5	2	2 5
	3		3
	4		4
	5		5
	6		6

18

DIAGNOSIS ICD-9 CODE	
Remote MTF	Medical Center
E 0 0 0.0 0	E 0 0 0.0 0
M 1 1 1.1 1	M 1 1 1.1 1
2 2 2.2 2	2 2 2.2 2
3 3 3.3 3	3 3 3.3 3
4 4 4.4 4	4 4 4.4 4
5 5 5.5 5	5 5 5.5 5
6 6 6.6 6	6 6 6.6 6
7 7 7.7 7	7 7 7.7 7
8 8 8.8 8	8 8 8.8 8
9 9 9.9 9	9 9 9.9 9
V V V.V V	V V V.V V

19

DISPOSITION BY CONSULTANT

- ▢ Back to PCM for Treatment
- *Patient Travel to Specialist
  - ▢ Civilian
    - ▢ for Clinic Appointment
    - ▢ for Procedure
    - ▢ for Ambulatory Surgery
  - ▢ MHSS
    - ▢ for Clinic Appointment
    - ▢ for Procedure
    - ▢ for Ambulatory Surgery
- ▢ Specialist Travel to Patient (i.e., C-21 Program)
- ▢ Interactive Consult
- *Admission
  - ▢ Civilian Facility
  - ▢ MHSS MTF

20

LOCATION OF F/U CARE

- ▢ WHMC
- ▢ BAMC
- ▢ Local MTF
- ▢ CHAMPUS
- ▢ MEDICARE
- ▢ Active Duty - Civ. Site

SATISFACTION QUESTIONNAIRES

Patients and providers involved with the Region VI Telemedicine project are requested to answer the pertinent satisfaction questionnaire below. Please read the statements and then indicate your feeling about the statement.

KEY

(1) Strongly agree: (2) Agree: (3) Somewhat agree: (4) Disagree: (5) Strongly disagree

PATIENT

		N/A
22. * I was thoroughly informed what to expect in regard to the use of Telemedicine.	1 2 3 4 5	▢
23. * My medical needs were met.	1 2 3 4 5	▢
24. * I felt very comfortable with the physician who was with me and presented my case.	1 2 3 4 5	▢
25. * I felt very comfortable with the consultant.	1 2 3 4 5	▢
26. * I prefer Telemedicine over being transported to the consultant.	1 2 3 4 5	▢

PRESENTER

27. * I have used Telemedicine before.	1 2 3 4 5	▢
28. * Technical problems did not impair my ability to present case.	1 2 3 4 5	▢
29. * The patient was very comfortable with the use of Telemedicine.	1 2 3 4 5	▢
30. * Telemedicine was appropriate for use with this case.	1 2 3 4 5	▢
31. * I felt very comfortable presenting this patient and case via Telemedicine.	1 2 3 4 5	▢

CONSULTANT

32. * I have used Telemedicine before.	1 2 3 4 5	▢
33. * Technical problems did not impair my ability to make decisions.	1 2 3 4 5	▢
34. * Quality was sufficient for me to make medical determinations.	1 2 3 4 5	▢
35. * Telemedicine was very useful in development of a diagnosis.	1 2 3 4 5	▢
36. * Telemedicine was very useful in development of a treatment plan.	1 2 3 4 5	▢
37. * Telemedicine was appropriate for use with this case.	1 2 3 4 5	▢
38. * I was very comfortable consulting on this case via Telemedicine.	1 2 3 4 5	▢
39. * I had enough information to make decisions in this case.	1 2 3 4 5	▢

APPENDIX 3
REGION VI TELEMEDICINE PROJECT
DATA COLLECTION PLAN

GOAL

To improve the specialty referral system (ensuring at least cost neutrality, improve or at least not change quality and improve access) within Region VI through the use of telemedicine.

MODEL

Comparison of regional telemedicine network and protocols to status quo.

OBJECTIVES

Objective ①: Improve timeliness of obtaining MHSS specialty referrals.

Information Needs	Data Location or Methodology for Data Collection
Historical referral patterns - numbers, sites, and specialties (FY-95)	Sites & Specialities = Original referral study; Numbers = Review facility reports, RCMAS (inpt) & MASS (outpt)
NASs issued from remote sites for services available at MEDCENS (limited to high use specialties identified above)	RCMAS, CHCS, facility reports, FHFS NAS reports
Average time between referral and appointment with specialist - Telemedicine vs. Status Quo	Telemedicine: TDCF[1,2] blocks 4, 7, 9. Status Quo: Query identified remote sites and request average appointment waiting times for identified specialty clinics at MEDCENS. Conduct same query of specialty clinics and average results
Number of specialty referrals accomplished through telemedicine + traditional referrals as compared to historical baseline	Telemedicine: TDCF[1,2] block 2. Traditional and historical baseline: RCMAS, MASS, facility reports

Objective ②: Increase beneficiary and provider satisfaction.

Information Needs	Data Location or Methodology for Data Collection
Patient and provider attitude toward telemedicine in comparison with traditional face to face consultations	TDCF[1,2] blocks 26, 30, 31, 37, 38
A major component to beneficiary and provider satisfaction is diagnostic accuracy and treatment effectiveness	TDCF[1,2] blocks 18, 19, 20, 23, 30, 34, 35, 36, 37, 39. Consultations conducted via telemedicine should fall into the existing facility peer review and quality assurance mechanisms. Project evaluation will include a query of facility QA chairpersons concerning telemedicine outliers
Overall satisfaction with telemedicine (including the patient-provider relationship).	TDCF[1,2] blocks 22 - 39.

Objective ③: Prepare providers for support of deployed forces via teleconsulting.

Information Needs	Data Location or Methodology for Data Collection
Number and specific providers who have used telemedicine.	TDCF[1,2] blocks 3, 5, 6, 8, 10, 11, 27, 32.
General comfort level using telemedicine technology.	TDCF[1,2] blocks 3, 5, 6, 8, 10, 11, 27 - 39.

Objective ④: That the Region IV pilot telemedicine project is cost-effective or cost-neutral.

Cost of current referral system	
Information Needs	**Data Location or Methodology for Data Collection**
Personnel: Providers	MPERS (Salary table), physician special pay tables
Personnel: Active Duty patients and/or escorts	Review of policy on escorts, referral records, lost duty days, MPERS (Salary table)
Transportation (TAD/TDY expenditures)	Fund accounts of remote MTFs
Time Factor: Time of specialist per encounter	Review of specialty clinic appointment policy
Time Factor: Time of patient invested in specialty referral (including travel & other non-productive time if transported)	MTF / MEDCEN policy, TAD/TDY accounts
Active duty days lost (opportunity cost)	TAD/TDY accounts, MTF interviews / reports
Referral rates (Direct care & CHAMPUS)	RCMAS, MASS, MTF Supplemental care data
Specialty workload and marginal cost for WHMC & BAMC	MEPRS
Related CHAMPUS expenditures	RCMAS

Cost of referral system supplemented by Telemedicine	
Information Needs	**Data Location or Methodology for Data Collection**
Cost of telemedicine hardware	Program documentation / Contractors
Communication costs	Program documentation / Contractors
Cost of telemedicine training and related time costs of attendance	Program documentation, review of attendance records
Personnel: Providers	MPERS (Salary table), physician special pay tables + TDCF[1,2] blocks 2, 3, 5, 6, 8, 10, 11, 12, 16, 17
Personnel: Active Duty patients and/or escorts	Review of policy on escorts, referral records, lost duty days, MPERS (Salary table) + TDCF[1,2] blocks 2, 13, 14, 15
Transportation (TAD/TDY expenditures)	Fund accounts of remote MTFs +TDCF[1,2] blocks 2, 3, 4, 8, 9, 13, 14, 15
Time Factor: Time of providers per encounter	Review of specialty clinic appointment policy +TDCF[1,2] blocks 2, 3, 4, 8, 9, 12, 16, 17
Time Factor: Time of patient invested in specialty referral (including travel & other non-productive time if transported)	MTF / MEDCEN policy, TAD/TDY accounts +TDCF[1,2] blocks 2, 3, 4, 9, 17
Active duty days lost (opportunity cost)	TAD/TDY accounts, MTF interviews / reports +TDCF[1,2] blocks 2, 3, 4, 8, 9, 13, 14, 15
Referral rates (Direct care & CHAMPUS)	RCMAS, MASS, MTF Supplemental care data
Specialty workload and marginal cost for WHMC & BAMC	MEPRS
Related CHAMPUS expenditures	RCMAS
Related recaptured CHAMPUS workload	TDCF[1,2] block 1

Objective ⑤: Integrate regional referral process with regional managed care outreach program and facilitate cross service referrals.

Information Needs	Data Location or Methodology for Data Collection
Number and type of specialty referrals between remote MTFs and MEDCENs broken down by service affiliation of treatment facilities.	Original study +TDCF[1, 2] blocks 2, 3, 8
Above information for current system and for system after the introduction of telemedicine.	Original study +TDCF[1, 2] blocks 2, 3, 8

[1] - TDCF: Telemedicine Data Collection Form

[2] - This information will be gathered via the protocol database once developed

APPENDIX 4
REGION VI TELEMEDICINE PROJECT
FIELD DATA COLLECTION PROCEDURES

Remote MTF

1. Non-interactive (Store & Forward) telemedicine consult
   a. Upon presentation of patient, technician will review health record, interview patient, and use provider prepared template to complete blocks 1 - 8 & 13 - 15 of the Telemedicine Data Collection Form.
   b. Following appointment, technician will have the patient complete blocks 22 - 26.
   c. Provider will complete the form by filling out blocks 12, 17a, 18a, 27 -31.
   d. Technician will batch forms and mail to TRICARE office on the 1st of the month.
2. Interactive telemedicine consult
   a. Upon presentation of patient, technician will review health record, interview patient, and use provider prepared template to complete blocks 1 - 8 & 13 - 15 of the Telemedicine Data Collection Form.
   b. Following appointment, technician will have the patient complete blocks 22 - 26.
   c. Provider will complete the form by filling out blocks 12, 17a, 18a, 27 -31.
   d. Technician will batch forms and mail to TRICARE office on the 1st of the month.

Medical Center

1. Non-interactive (Store & Forward) telemedicine consult
   a. Technician who sets up computer system prior to physician actually performing consultative services will complete blocks 2 - 4, 8 - 11, & 13 -15 of the Telemedicine Data Collection Form. In addition to the information contained in the computer, a provider prepared template will also be necessary for completion of blocks 10 & 11.
   b. Provider will complete the form by filling out blocks 16, 17b, 18b, 19, 20, 32 -38.
   c. Technician will batch forms and mail to TRICARE office on the 1st of the month.
2. Interactive telemedicine consult
   a. Technician who sets up computer system prior to physician actually performing consultative services will complete blocks 2 - 4, 8 - 11, & 13 -15 of the Telemedicine Data Collection Form. In addition to the information contained in the computer, a provider prepared template will also be necessary for completion of blocks 10 & 11.
   b. Provider will complete the form by filling out blocks 16, 17b, 18b, 19, 20, 32 -38.
   c. Technician will batch forms and mail to TRICARE office on the 1st of the month.

Notes

1. Remote MTF and MEDCEN forms representing a single consultative interaction will be merged in the database once they are scanned at the TRICARE office.
2. The difficult part of this procedure will be accurately coding diagnosis by ICD-9. Efforts are underway to procure a superbill by specialty which will greatly simplify the coding process.

APPENDIX 5
TELEMEDICINE DATA COLLECTION FORM
BLOCK DEFINITIONS

Block	Block Title	Explanation	Who*
1	Referral Source	Where patient was referred from	T
2	Type of Consult	Interactive = presenter and consultant interact at same time Non-interactive (Store and Forward): Information gathered and electronically forwarded to consultant	T
3	Remote MTF	Physical location of presenter and patient	T
4	Date Services Performed	Date patient meets with presenter and teleconsult takes place	T
5	Provider Specialty Outpatient MEPR	Remote MTF - Enter appropriate MEPR code	T
6	Provider SSAN	Provider's social security number	T
7	Consult Scheduled	This is the date that determination was made that a consultation was required and the current telemedicine appointment was made (could be todays date)	T
8	Medical Center	Location of consultant	T
9	Date Services Performed	Date specialist performs interactive consult with patient or reviews non-interactive electronic record	T
10	Provider Specialty Outpatient MEPR	Medical Center - Enter appropriate MEPR code	T
11	Provider SSAN	Specialist's social security number	T
12	Patient Visit Type	CPT coding for patient type at remote MTF	P
13	FMP / Sponsor SSAN	Family Member Prefix followed by sponsor's social security number	T
14	Status	Status of patient	T
15	Patient or Sponsor's Paygrade	If patient is active duty - indicate patient's paygrade If patient is dependant of active duty - indicate sponsor's paygrade If patient is retired or dependent of retired - N/A	T
16	Patient Visit Type	CPT coding for patient type at medical center	C
17	Actual Time with Patient / Consult	This block indicates the actual time spent with the patient (or with the record in the case of specialists working with non-interactive consults) by the presenter, block (a) and by the consultant , block (b)	P&C
18	Primary Diagnosis ICD-9 Code	Block (a) - ICD-9 code for primary diagnosis at remote MTF Block (b) - ICD-9 code for primary diagnosis at medical center * Clinics will need to develop lists of primary diagnosis with the corresponding ICD-9 codes as the project progresses to simplify this step	P&C
19	Disposition by Consultant	Determination by consultant for patient follow-up	C
20	Location of F/U Care	Where follow-up should be accomplished	C

Block	Block Title	Explanation	Who*
21	Omitted		
22 thru 26	Patient Satisfaction Questionnaire	Questions to be completed by patient following appointment with presenter	Pt
27 thru 31	Presenter Satisfaction Questionnaire	Questions to be completed by presenter following appointment with patient	P
32 thru 39	Consultant Satisfaction Questionnaire	Questions to be completed by consultant following telemedicine consultation	C

* Note: This column indicates who should fill out this block on the form.
T - Technician; **P** - Presenter; **C** - Consultant; **Pt** - Patient

** With the exception of the patient satisfaction section, the rest of the data collection form could be filled out by technician if specific procedures are implemented, i.e., providers could ensure appropriate information is placed in the medical record / consultation notes for the technician to transcribe.

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